

# N-Channel Enhancement Mode MOSFET

## 1. Product Information

### 1.1 Features

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

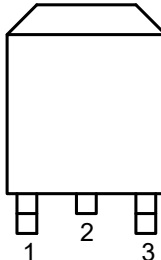
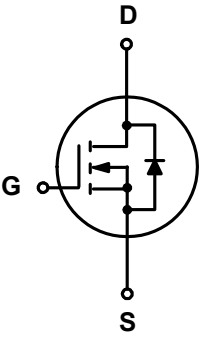
### 1.2 Applications

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

### 1.3 Quick reference

- ☒  $BV \geq 30\text{ V}$
- ☒  $P_{tot} \leq 50\text{ W}$
- ☒  $I_D \leq 120\text{ A}$
- ☒  $R_{DS(ON)} \leq 3.3\text{ m}\Omega @ V_{GS} = 10\text{ V}$
- ☒  $R_{DS(ON)} \leq 5.0\text{ m}\Omega @ V_{GS} = 4.5\text{ V}$

## 2. Pin Description

| Pin | Description | Simplified Outline                                                                                            | Symbol                                                                                |
|-----|-------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1   | Gate(G)     |  <p>Top View<br/>TO252</p> |  |
| 2   | Drain(D)    |                                                                                                               |                                                                                       |
| 3   | Source(S)   |                                                                                                               |                                                                                       |

## 3. Limiting Values

| Symbol                           | Parameter                               | Conditions                                     | Min | Max | Unit |
|----------------------------------|-----------------------------------------|------------------------------------------------|-----|-----|------|
| V <sub>DS</sub>                  | Drain-Source Voltage                    | T <sub>C</sub> = 25 °C                         | 30  | -   | 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 | -   | 120 | A    |
| I <sub>DM</sub> <sup>*,***</sup> | Drain Current ( Pulsed )                | T <sub>C</sub> = 25 °C, V <sub>GS</sub> = 10 V | -   | 220 | A    |
| P <sub>tot</sub>                 | Drain power dissipation                 | T <sub>C</sub> = 25 °C                         | -   | 50  | 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                         | -   | 120 | A    |
| R <sub>θJA</sub> <sup>**</sup>   | Thermal Resistance- Junction to Ambient |                                                | -   | 37  | °C/W |
| R <sub>θJC</sub> <sup>**</sup>   | Thermal Resistance- Junction to Case    |                                                | -   | 1.2 |      |

Notes :

- \* Pulse width ≤ 300 μs, duty cycle ≤ 2 %
- \*\* Mounted on Large Heat Sink
- \*\*\* limited by bonding wire

## 4. Marking Information

| Product Name | Marking                                                          |
|--------------|------------------------------------------------------------------|
| UP120N03K    | <div>120N03</div> <div>YWWXXX</div> <div>YWWXXX: Date Code</div> |

## 5. Ordering Code

| Product Name | Package | Reel Size | Tape width | Quantity | Note |
|--------------|---------|-----------|------------|----------|------|
| UP120N03K    | TO252   |           |            | 2500     |      |

Note: UOE defines “ Green ” as lead-free ( RoHS compliant ) and halogen free ( Br or Cl does not exceed 900 ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500 ppm by weight; Follow IEC 61249-2-21 and IPC / JEDEC J-STD-020C )

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

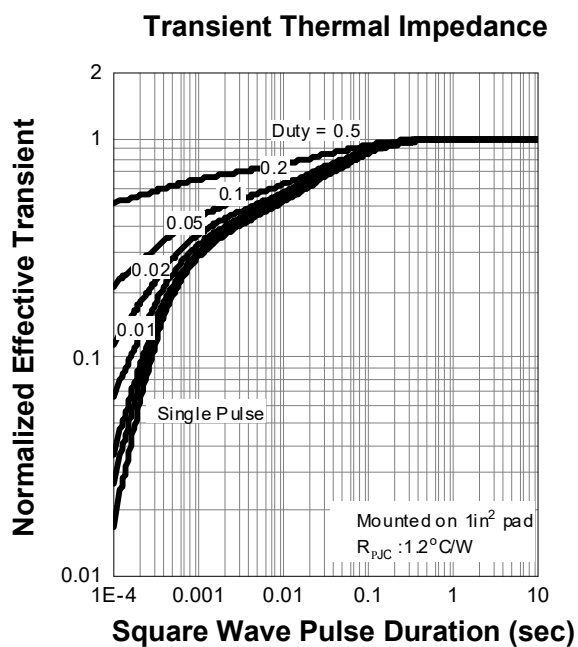
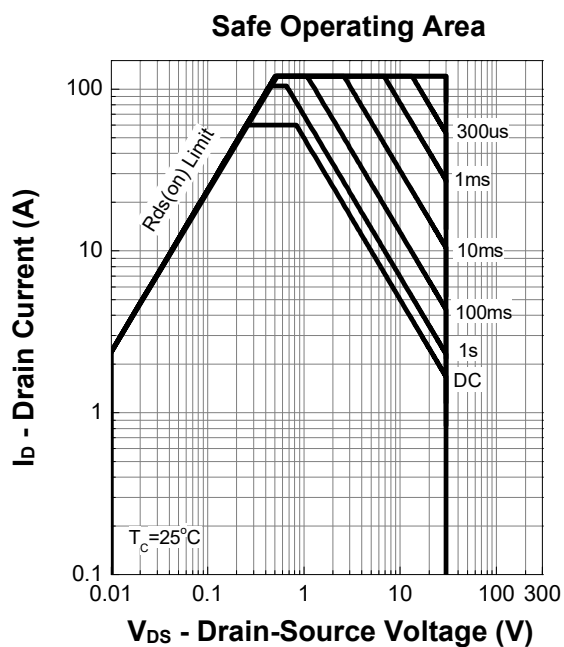
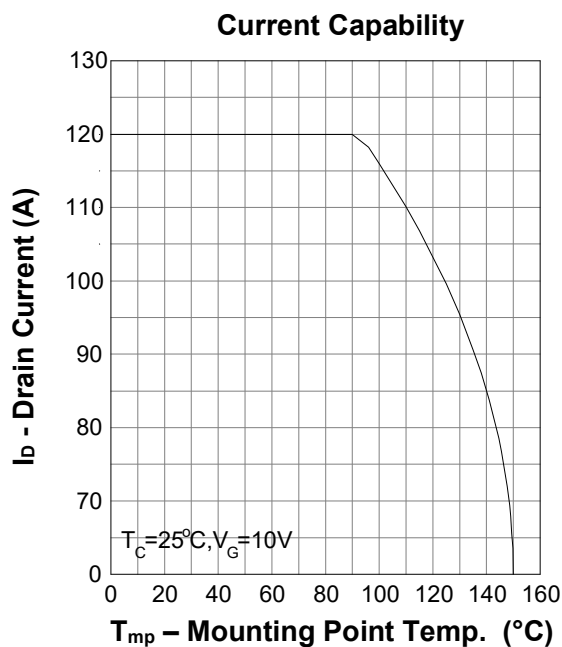
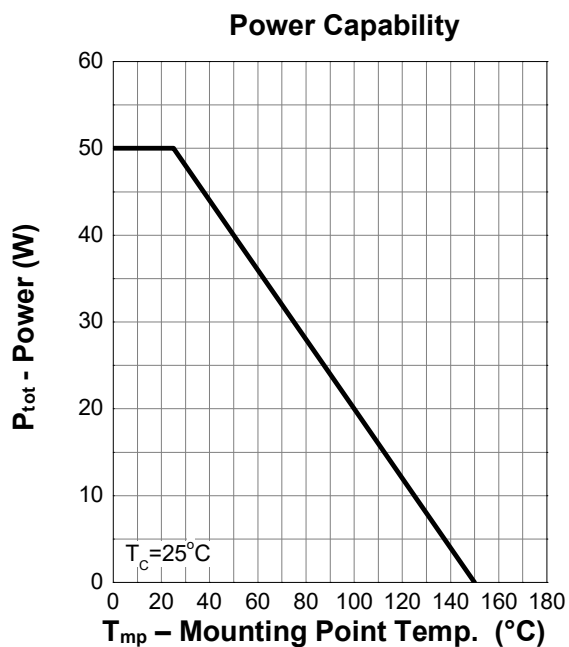
| Symbol                                   | Parameter                      | Conditions                                                                                                                     | Min | Typ  | Max  | Unit |
|------------------------------------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-----|------|------|------|
| Static Characteristics                   |                                |                                                                                                                                |     |      |      |      |
| BV <sub>DSS</sub>                        | Drain-Source Breakdown Voltage | V <sub>GS</sub> = 0 V, I <sub>DS</sub> = 250 μA                                                                                | 30  | -    | -    | V    |
| V <sub>GS(th)</sub>                      | Gate Threshold Voltage         | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>DS</sub> = 250 μA                                                                   | 1   | -    | 2    | V    |
| I <sub>DSS</sub>                         | Drain Leakage Current          | V <sub>DS</sub> = 24 V, V <sub>GS</sub> = 0 V                                                                                  | -   | -    | 1    | μA   |
| I <sub>GSS</sub>                         | Gate Leakage Current           | V <sub>GS</sub> = 0 V, V <sub>GS</sub> = ± 20 V                                                                                | -   | -    | ±100 | nA   |
| R <sub>DS(ON)</sub> <sup>a</sup>         | On-State Resistance            | V <sub>GS</sub> = 10 V, I <sub>DS</sub> = 20 A                                                                                 | -   | 3.0  | 3.3  | m Ω  |
|                                          |                                | V <sub>GS</sub> = 4.5 V, I <sub>DS</sub> =10 A                                                                                 | -   | 4.5  | 5.0  |      |
| Diode Characteristics                    |                                |                                                                                                                                |     |      |      |      |
| V <sub>SD</sub> <sup>a</sup>             | Diode Forward Voltage          | I <sub>SD</sub> = 20 A, V <sub>GS</sub> = 0 V                                                                                  | -   | -    | 1.3  | V    |
| t <sub>rr</sub>                          | Reverse Recovery Time          | I <sub>DS</sub> = 20 A, V <sub>GS</sub> = 0 V<br>di <sub>SD</sub> /dt = 100 A/μs                                               | -   | 18   | -    | nS   |
| Q <sub>rr</sub>                          | Reverse Recovery Charge        |                                                                                                                                | -   | 9    | -    | μC   |
| Dynamic Characteristics <sup>b</sup>     |                                |                                                                                                                                |     |      |      |      |
| C <sub>iss</sub>                         | Input Capacitance              | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 15 V<br>Frequency = 1 MHz                                                             | -   | 3650 | -    | pF   |
| C <sub>oss</sub>                         | Output Capacitance             |                                                                                                                                | -   | 317  | -    |      |
| C <sub>rss</sub>                         | Reverse Transfer Capacitance   |                                                                                                                                | -   | 265  | -    |      |
| t <sub>a(on)</sub>                       | Turn-on Delay Time             | V <sub>DS</sub> = 15 V, V <sub>GEN</sub> = 10 V,<br>R <sub>G</sub> = 4.5 Ω, R <sub>L</sub> = 0.75 Ω,<br>I <sub>DS</sub> = 20 A | -   | 14   | -    | nS   |
| t <sub>r</sub>                           | Turn-on Rise Time              |                                                                                                                                | -   | 72   | -    |      |
| t <sub>a(off)</sub>                      | Turn-off Delay Time            |                                                                                                                                | -   | 57   | -    |      |
| t <sub>f</sub>                           | Turn-off Fall Time             |                                                                                                                                | -   | 65   | -    |      |
| Gate Charge Characteristics <sup>b</sup> |                                |                                                                                                                                |     |      |      |      |
| Q <sub>g</sub>                           | Total Gate Charge              | V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 10 V,<br>I <sub>DS</sub> = 20 A                                                      | -   | 65   | -    | nC   |
| Q <sub>gs</sub>                          | Gate-Source Charge             |                                                                                                                                | -   | 13   | -    |      |
| Q <sub>gd</sub>                          | Gate-Drain Charge              |                                                                                                                                | -   | 9.7  | -    |      |

Notes :

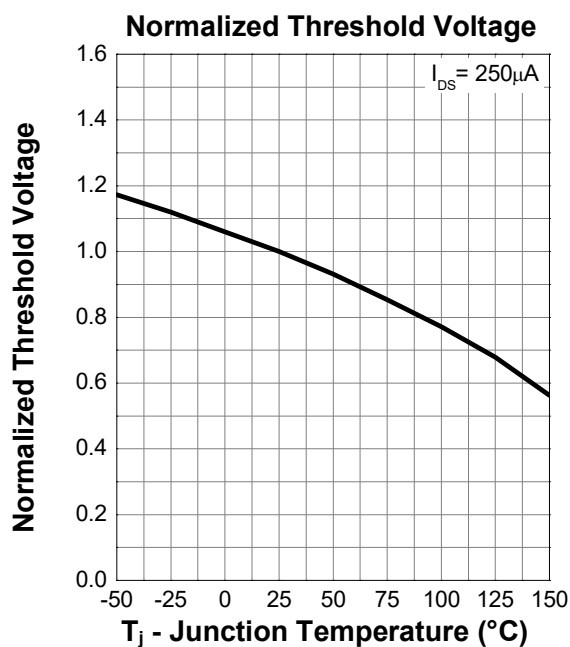
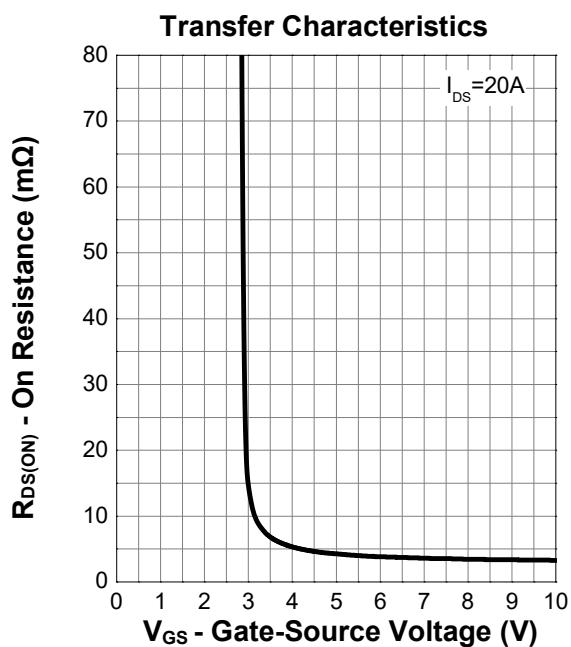
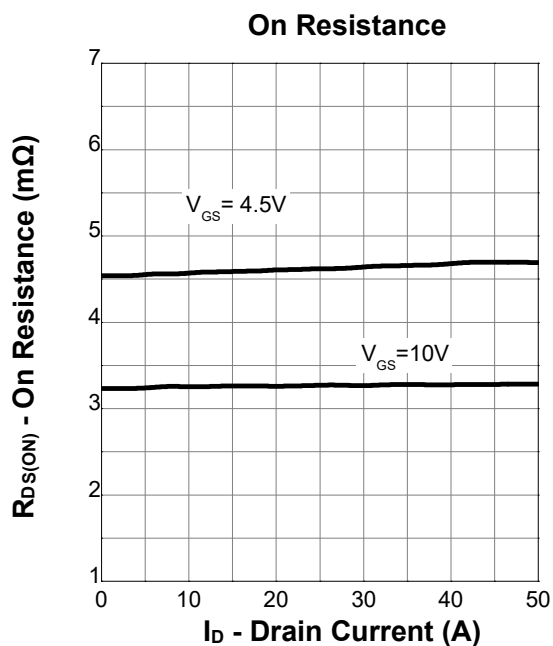
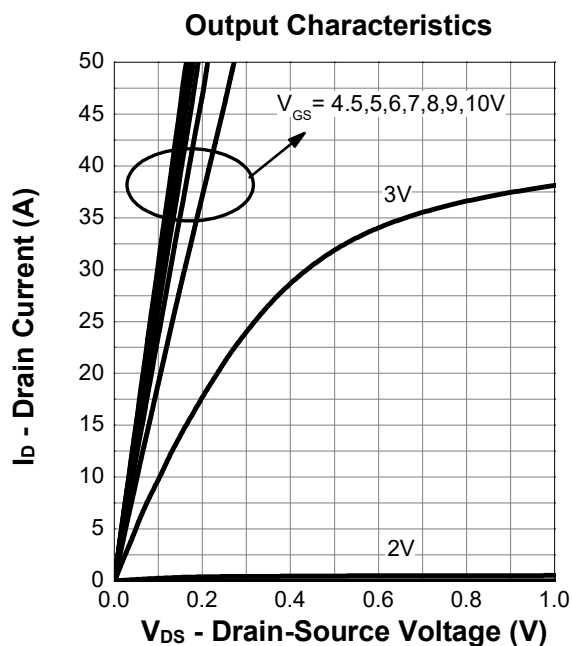
a : Pulse test ; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$

b : Guaranteed by design, not subject to production testing

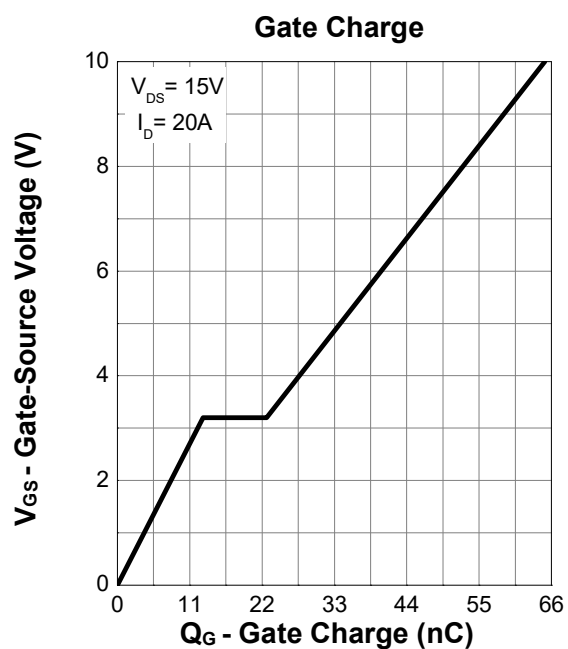
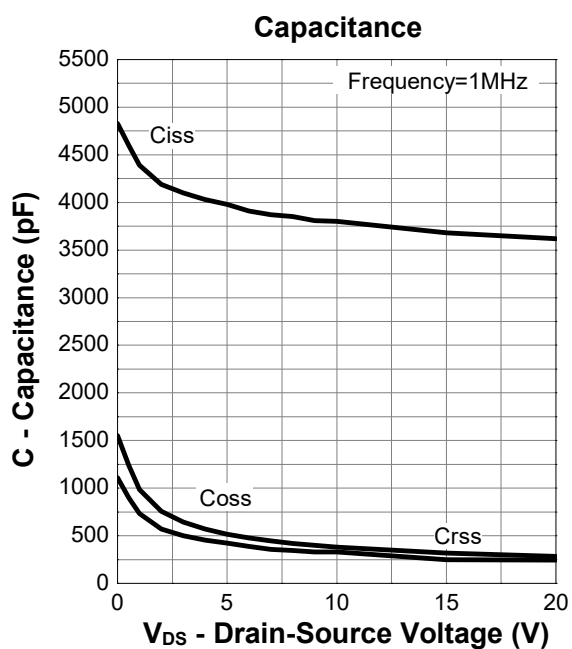
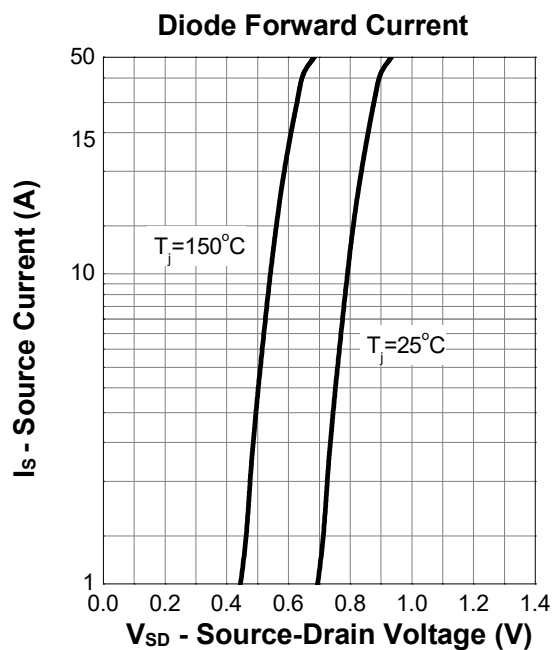
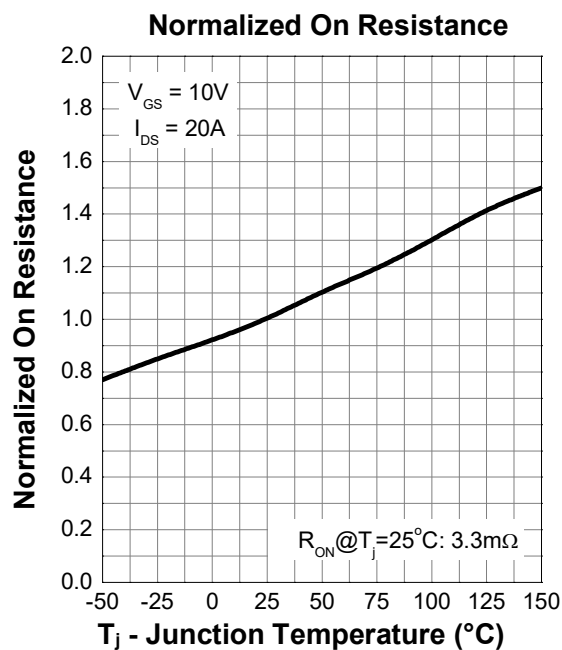
## 7. Typical Characteristics



## 7. Typical Characteristics (cont.)

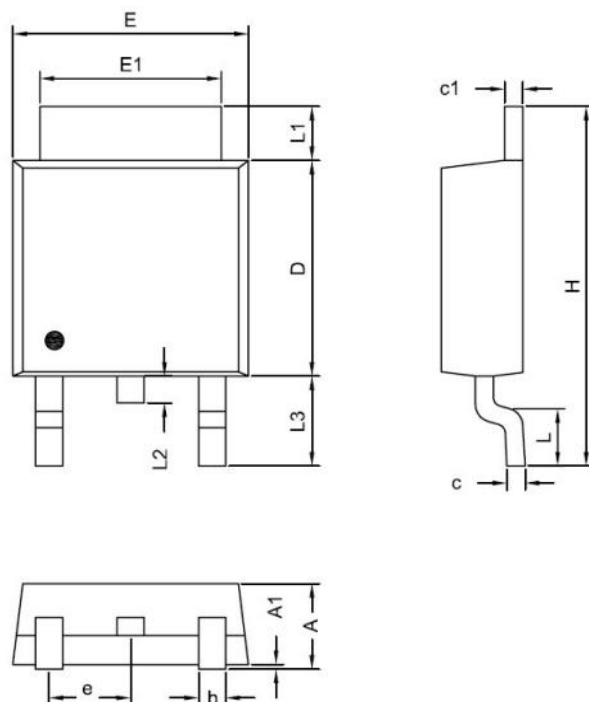


## 7. Typical Characteristics (cont.)



## 8.Package Dimensions

### TO252-3L



| Symbol | Dimensions In Millimeters |       |
|--------|---------------------------|-------|
|        | MIN.                      | MAX.  |
| A      | 2.19                      | 2.38  |
| A1     | 0.02                      | 0.13  |
| D      | 5.30                      | 6.40  |
| E      | 6.35                      | 6.80  |
| E1     | 5.20                      | 5.50  |
| c      | 0.40                      | 0.60  |
| c1     | 0.40                      | 0.60  |
| b      | 0.55                      | 0.85  |
| e      | 2.30 BCS                  |       |
| L      | 1.00                      | 1.80  |
| L1     | 0.70                      | 1.80  |
| L2     | 0.70 BCS                  |       |
| L3     | 2.40                      | 2.80  |
| H      | 9.20                      | 10.40 |