

**LMNP2062RF 20V N+P Dual Channel MOSFETs**
**Features**

- N-Channel
- 20V/4.0A,  $R_{DS(ON)}=30m\Omega@V_{GS}=4.5V$
- 20V/3.0A,  $R_{DS(ON)}=30m\Omega@V_{GS}=2.5V$
- P-Channel
- -20V/-3.0A,  $R_{DS(ON)}=65m\Omega@V_{GS}=-4.5V$
- -20V/-2.4A,  $R_{DS(ON)}=85m\Omega@V_{GS}=-2.5V$
- Low On Resistance
- Low Gate Charge
- Fast switching speed
- SOT-23-6L package design

**Product Description**

LMNP2062RF, N&amp;P Pair enhancement mode

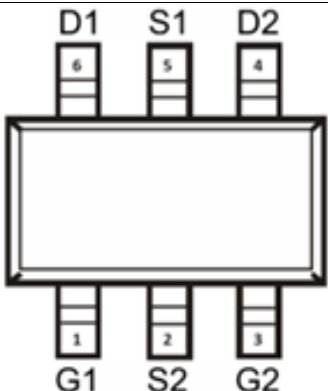
MOSFET, uses Advanced Trench Technology to provide excellent  $R_{DS(ON)}$ , low gate charge.

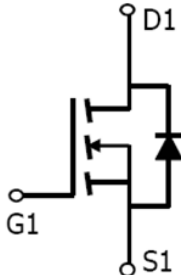
These devices are particularly suited for low voltage power management, and low in-line power loss are needed in commercial industrial surface mount applications.

**Applications**

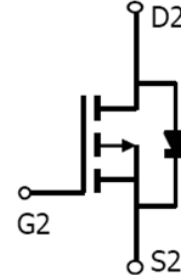
- Power Management in Notebook
- Portable Equipment
- Battery Powered System
- DC/DC Converter
- Load Switch
- LCD Display inverter

**Pin Configuration**

| LMNP2062RF (SOT-23-6L)                                                             |        |             |
|------------------------------------------------------------------------------------|--------|-------------|
|  |        |             |
| Pin                                                                                | Symbol | Description |
| 1                                                                                  | G1     | Gate 1      |
| 2                                                                                  | S2     | Source 2    |
| 3                                                                                  | G2     | Gate 2      |
| 4                                                                                  | D2     | Drain 2     |
| 5                                                                                  | S1     | Source 1    |
| 6                                                                                  | D1     | Drain1      |



**n-channel**



**p-channel**

**Ordering Information**

| Ordering Information |          |          |              |           |          |
|----------------------|----------|----------|--------------|-----------|----------|
| Part Number          | P/N      | PKG code | Pb Free code | Package   | Quantity |
| LMNP2062RF           | LMNP2062 | R        | F            | SOT-23-6L | 3000pcs  |

**Marking Information**

| Marking Information |           |
|---------------------|-----------|
| Part Number         | LFC code  |
| <u>P3</u>           | <u>WM</u> |

**Absolute Maximum Ratings**

(T<sub>C</sub>=25°C Unless otherwise noted)

| Symbol           | Parameter                                                        |                                   | Typical   |           | Unit |
|------------------|------------------------------------------------------------------|-----------------------------------|-----------|-----------|------|
|                  |                                                                  |                                   | N-Channel | P-Channel |      |
| V <sub>DSS</sub> | Drain-Source Voltage                                             |                                   | 20        | -20       | V    |
| V <sub>GSS</sub> | Gate-Source Voltage                                              |                                   | ±12       | ±12       | V    |
| I <sub>D</sub>   | Continuous Drain Current<br>(T <sub>J</sub> =150°C) <sup>1</sup> | T <sub>A</sub> =25°C <sup>1</sup> | 5.5       | -3.7      | A    |
|                  |                                                                  | T <sub>A</sub> =70°C              | 4         | -3.0      |      |
| I <sub>DM</sub>  | Pulsed Drain Current                                             |                                   | 15        | -10       | A    |
| I <sub>S</sub>   | Continuous Source Current (Diode Conduction)                     |                                   | 1.5       | -1.5      |      |
| P <sub>D</sub>   | Power Dissipation                                                | T <sub>A</sub> =25°C              | 1.4       |           | W    |
|                  |                                                                  | T <sub>A</sub> =70°C              | 0.9       |           | W/°C |
| T <sub>J</sub>   | Operating Junction Temperature                                   |                                   | 150       |           | °C   |
| T <sub>STG</sub> | Storage Temperature Range                                        |                                   | -55/150   |           | °C   |
| R <sub>θJA</sub> | Thermal Resistance-Junction to Case                              |                                   | 90        |           | °C/W |

Note:

1.Device mounted on FR-4 substrate PCB, 2oz copper, with 1inch square copper plate.

**Electrical Characteristics(N-Channel)**

(T<sub>C</sub>=25°C Unless otherwise noted)

| Symbol                  | Parameter                         | Conditions                                                     | Min | Typ | Max  | Unit |
|-------------------------|-----------------------------------|----------------------------------------------------------------|-----|-----|------|------|
| Static characteristics  |                                   |                                                                |     |     |      |      |
| V <sub>(BR)DSS</sub>    | Drain-Source Breakdown Voltage    | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA                     | 20  |     |      | V    |
| V <sub>GS (th)</sub>    | Gate Threshold Voltage            | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA       | 0.4 |     | 0.9  | V    |
| I <sub>GSS</sub>        | Gate Leakage Current              | V <sub>DS</sub> =0V, V <sub>GS</sub> =±12V                     |     |     | ±100 | nA   |
| I <sub>DSS</sub>        | Drain-Source Leakage Current      | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V                      |     |     | 1    | uA   |
| V <sub>SD</sub>         | Diode Forward Voltage             | V <sub>GS</sub> =0V, I <sub>S</sub> =1A                        |     |     | 1    | V    |
| R <sub>DS(on)</sub>     | Drain-Source On-Resistance        | V <sub>GS</sub> =4.5V, I <sub>D</sub> =4A                      |     | 21  | 30   | mΩ   |
|                         |                                   | V <sub>GS</sub> =2.5V, I <sub>D</sub> =3A                      |     | 28  | 35   |      |
|                         |                                   | V <sub>GS</sub> =1.8V, I <sub>D</sub> =2A                      |     | 40  | 55   |      |
| g <sub>FS</sub>         | Forward Transconductance          | V <sub>DS</sub> =10V, I <sub>D</sub> =3A                       |     |     | 10   | S    |
| Dynamic characteristics |                                   |                                                                |     |     |      |      |
| Q <sub>g</sub>          | Total Gate Charge <sup>1,2</sup>  | V <sub>DS</sub> =10V, V <sub>GS</sub> =4.5, I <sub>D</sub> =5A |     | 6.7 |      | nC   |
| Q <sub>gs</sub>         | Gate-Source Charge <sup>1,2</sup> |                                                                |     | 0.8 |      |      |
| Q <sub>gd</sub>         | Gate-Drain Charge <sup>1,2</sup>  |                                                                |     | 3.0 |      |      |
| Dynamic characteristics |                                   |                                                                |     |     |      |      |
| C <sub>iss</sub>        | Input Capacitance                 | V <sub>DS</sub> =10V, V <sub>GS</sub> =0V, f=1.0MHz            |     | 532 |      | pF   |
| C <sub>oss</sub>        | Output Capacitance                |                                                                |     | 144 |      |      |
| C <sub>rss</sub>        | Reverse Transfer Capacitance      |                                                                |     | 117 |      |      |

**Electrical Characteristics(P-Channel)**

(T<sub>C</sub>=25°C Unless otherwise noted)

| Symbol                  | Parameter                         | Conditions                                                                              | Min  | Typ | Max  | Unit |
|-------------------------|-----------------------------------|-----------------------------------------------------------------------------------------|------|-----|------|------|
| Static characteristics  |                                   |                                                                                         |      |     |      |      |
| V <sub>(BR)DSS</sub>    | Drain-Source Breakdown Voltage    | V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA                                             | -20  |     |      | V    |
| V <sub>GS (th)</sub>    | Gate Threshold Voltage            | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250uA                               | -0.4 |     | -0.9 | V    |
| I <sub>GSS</sub>        | Gate Leakage Current              | V <sub>DS</sub> =0V, V <sub>GS</sub> =±12V                                              |      |     | ±100 | nA   |
| I <sub>DSS</sub>        | Drain-Source Leakage Current      | V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V                                              |      |     | 1    | uA   |
| V <sub>SD</sub>         | Diode Forward Voltage             | V <sub>GS</sub> =0V, I <sub>S</sub> =-1A                                                |      |     | -1.2 | V    |
| R <sub>DS(on)</sub>     | Drain-Source On-Resistance        | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-3A                                             |      | 55  | 65   | mΩ   |
|                         |                                   | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-2.4A                                           |      | 74  | 85   |      |
|                         |                                   | V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-1.5A                                           |      | 100 | 130  |      |
| g <sub>FS</sub>         | Forward Transconductance          | V <sub>DS</sub> =-5V, I <sub>D</sub> =-2.8A                                             |      |     | 12   | S    |
| Dynamic characteristics |                                   |                                                                                         |      |     |      |      |
| Q <sub>g</sub>          | Total Gate Charge <sup>1,2</sup>  | V <sub>DS</sub> =-10V, V <sub>GS</sub> =-4.5, I <sub>D</sub> =-3A                       |      | 7.3 |      | nC   |
| Q <sub>gs</sub>         | Gate-Source Charge <sup>1,2</sup> |                                                                                         |      | 2.0 |      |      |
| Q <sub>gd</sub>         | Gate-Drain Charge <sup>1,2</sup>  |                                                                                         |      | 1.9 |      |      |
| C <sub>iss</sub>        | Input Capacitance                 | V <sub>DS</sub> =-16V, V <sub>GS</sub> =0V, f=1.0MHz                                    |      | 443 |      | pF   |
| C <sub>oss</sub>        | Output Capacitance                |                                                                                         |      | 128 |      |      |
| C <sub>rss</sub>        | Reverse Transfer Capacitance      |                                                                                         |      | 101 |      |      |
| t <sub>d(on)</sub>      | Turn-On Time                      | V <sub>DD</sub> =-10V, V <sub>GEN</sub> =-4.5V, R <sub>L</sub> =10Ω, R <sub>G</sub> =6Ω |      | 12  |      | ns   |
| t <sub>r</sub>          |                                   |                                                                                         |      | 20  |      |      |
| t <sub>d(off)</sub>     | Turn-Off Time                     |                                                                                         |      | 38  |      |      |
| t <sub>f</sub>          |                                   |                                                                                         |      | 41  |      |      |

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
3. Essentially independent of operating temperature.

# Typical Performance Characteristics(N-Channel)

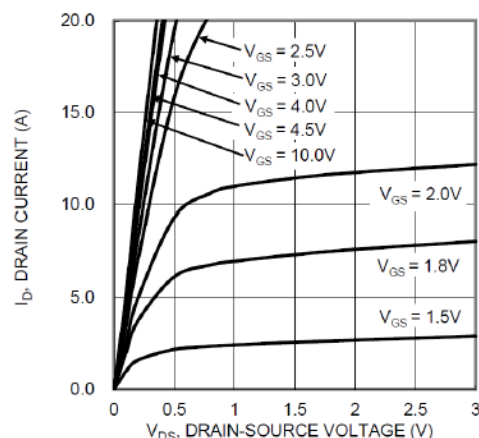


Fig. 1 Typical Output Characteristics

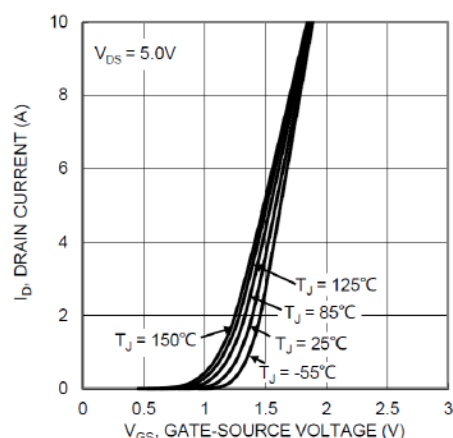


Fig. 2 Typical Transfer Characteristics

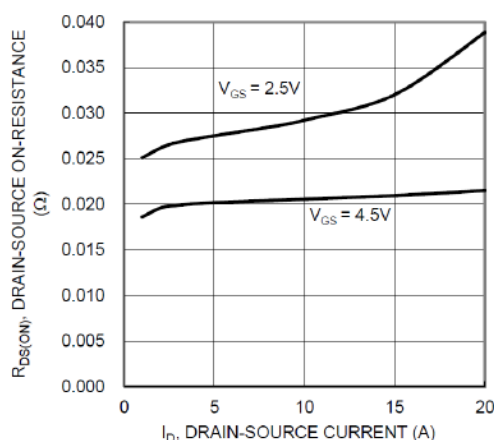


Fig. 3 Typical On-Resistance vs.  $I_D$  and  $V_{GS}$

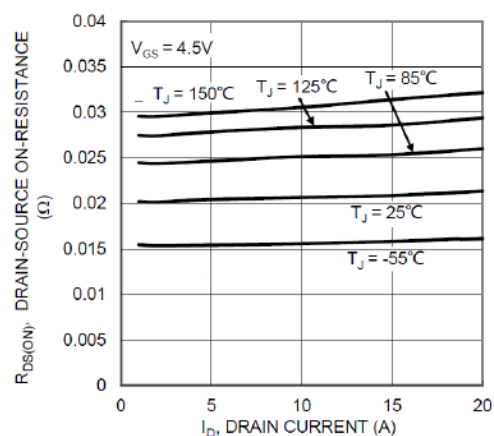


Fig. 4 Typical Drain-Source On Resistance vs.  $I_D$  and  $T_A$

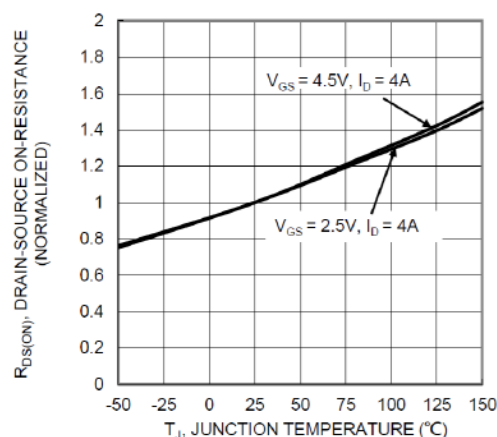


Fig. 5 On-Resistance Variation with  $T_A$

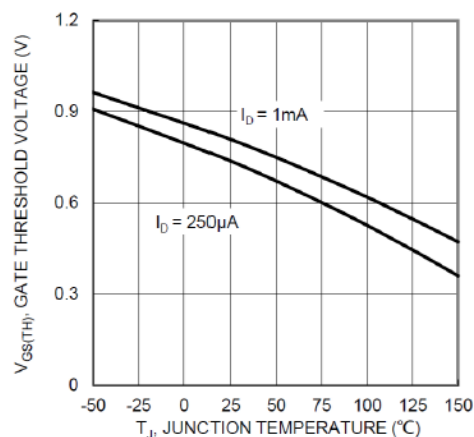
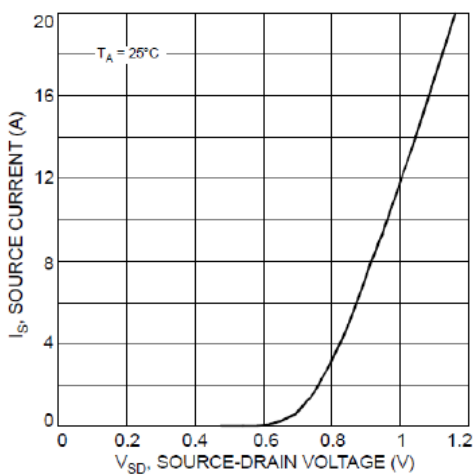
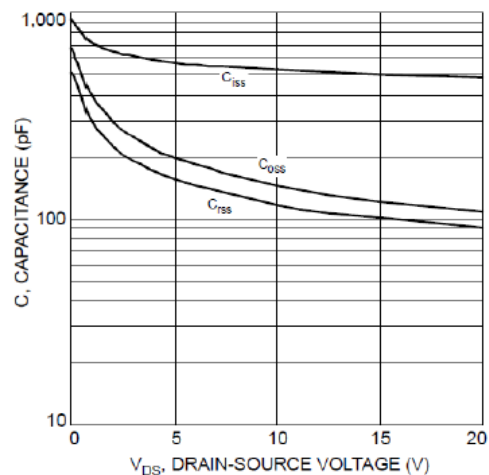
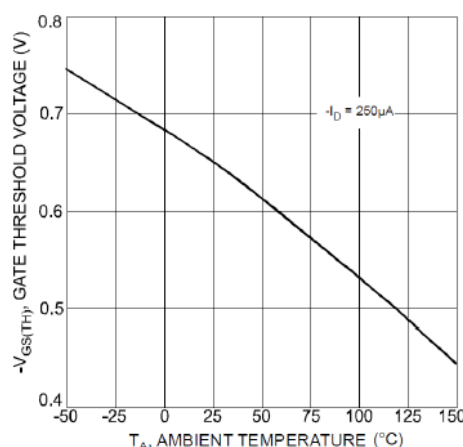
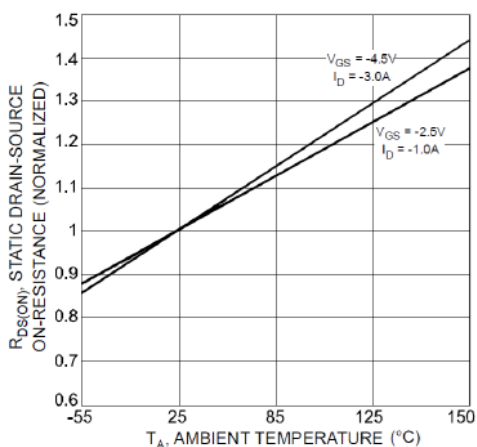
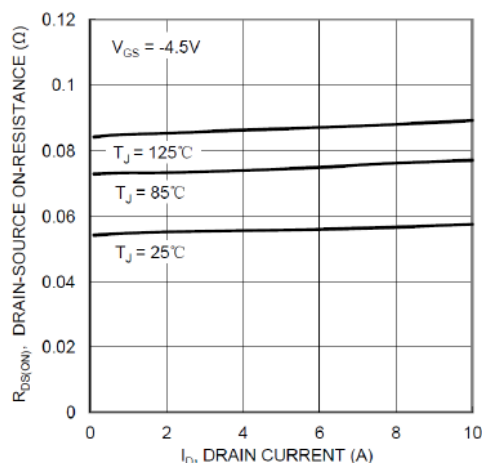
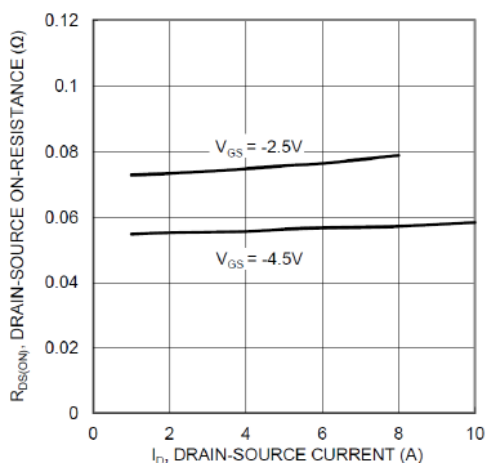
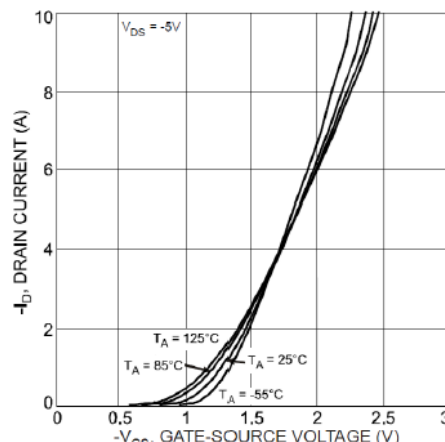
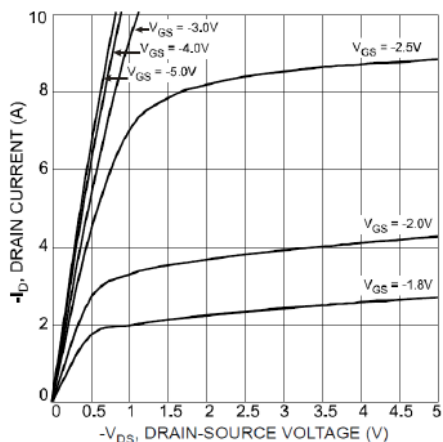
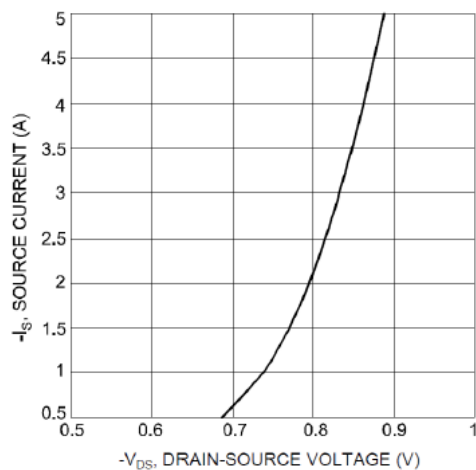
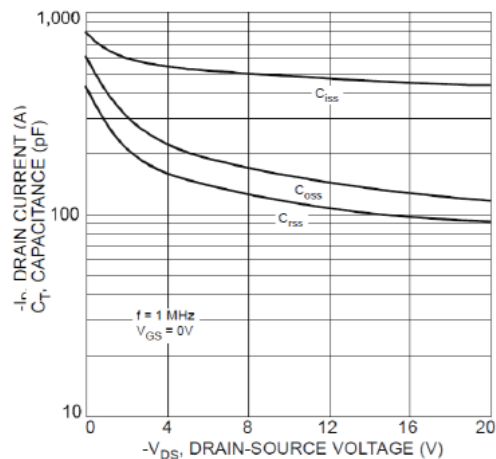


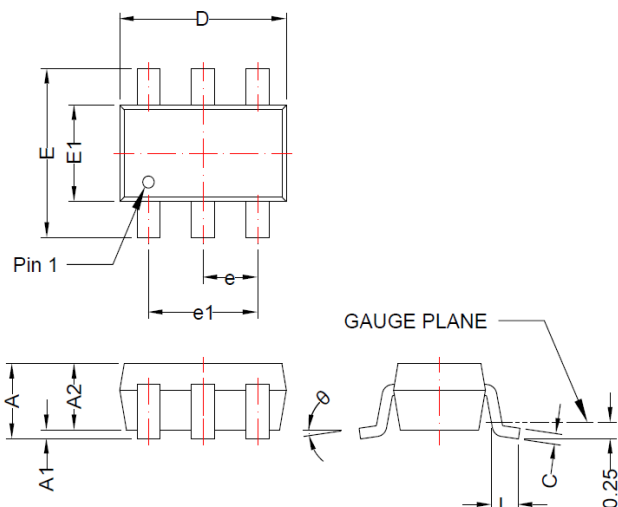
Fig. 6 Gate Threshold Variation with  $T_A$

**Typical Performance Characteristics(N-Channel Continue)**

**Fig. 7 Diode Forward Voltage vs. Current**

**Fig.8 Typical Capacitance**

# Typical Performance Characteristics(P-Channel)



**Typical Performance Characteristics (P-Channel Continue)**

**Fig. 7 Diode Forward Voltage vs. Current**

**Fig.8 Typical Capacitance**

**Package Dimension:**
**SOT-23-6L**


| Dimensions |             |      |           |       |
|------------|-------------|------|-----------|-------|
| Symbol     | Millimeters |      | Inches    |       |
|            | Min         | Max  | Min       | Max   |
| <b>A</b>   | 0.90        | 1.45 | 0.035     | 0.057 |
| <b>A1</b>  | 0.00        | 0.15 | 0.000     | 0.006 |
| <b>A2</b>  | 0.90        | 1.30 | 0.035     | 0.051 |
| <b>b</b>   | 0.30        | 0.50 | 0.012     | 0.020 |
| <b>c</b>   | 0.08        | 0.26 | 0.003     | 0.010 |
| <b>D</b>   | 2.70        | 3.10 | 0.106     | 0.122 |
| <b>E</b>   | 2.20        | 3.00 | 0.087     | 0.118 |
| <b>E1</b>  | 1.30        | 1.75 | 0.051     | 0.069 |
| <b>e</b>   | 0.95 BSC    |      | 0.037 BSC |       |
| <b>e1</b>  | 1.90 BSC    |      | 0.075 BSC |       |
| <b>L</b>   | 0.30        | 0.60 | 0.012     | 0.024 |
| <b>θ</b>   | 0°          | 8°   | 0°        | 8°    |

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