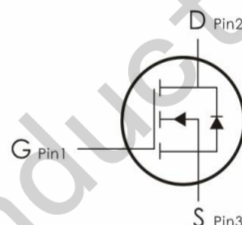
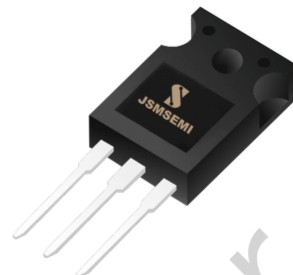


## FEATURES

- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

## APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)



| Device Marking and Package Information |         |          |
|----------------------------------------|---------|----------|
| Device                                 | Package | Marking  |
| FDA59N25                               | TO-247  | FDA59N25 |

| Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ , unless otherwise noted |                |            |                  |
|----------------------------------------------------------------------------|----------------|------------|------------------|
| Parameter                                                                  | Symbol         | Value      | Unit             |
|                                                                            |                | TO-247     |                  |
| Drain-Source Voltage                                                       | $V_{DS}$       | 250        | V                |
| Continuous Drain Current                                                   | $I_D$          | 70         | A                |
| Pulsed Drain Current (note2)                                               | $I_{DM}$       | 280        | A                |
| Gate-Source Voltage                                                        | $V_{GS}$       | $\pm 20$   | V                |
| Single Pulse Avalanche Energy (note2)                                      | $E_{AS}$       | 780        | mJ               |
| Avalanche Current (note1)                                                  | $I_{AR}$       | 39.5       | V/ns             |
| Repetitive Avalanche Energy (note1)                                        | $E_{AR}$       | 468        | mJ               |
| Power Dissipation ( $T_C = 25^\circ\text{C}$ )                             | $P_D$          | 400        | W                |
| Operating Junction and Storage Temperature Range                           | $T_J, T_{stg}$ | -55 to 175 | $^\circ\text{C}$ |

| Thermal Resistance                      |            |        |                    |
|-----------------------------------------|------------|--------|--------------------|
| Parameter                               | Symbol     | Value  | Unit               |
|                                         |            | TO-247 |                    |
| Thermal Resistance, Junction-to-Case    | $R_{thJC}$ | 0.5    | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{thJA}$ | 45     |                    |

**Specifications**  $T_J = 25^\circ\text{C}$ , unless otherwise noted

| Parameter                               | Symbol        | Test Conditions                                               | Value |      |      | Unit       |
|-----------------------------------------|---------------|---------------------------------------------------------------|-------|------|------|------------|
|                                         |               |                                                               | Min.  | Typ. | Max. |            |
| Static                                  |               |                                                               |       |      |      |            |
| Drain-Source Breakdown Voltage          | $V_{(BR)DSS}$ | $V_{GS} = 0V, I_D = 250\mu A$                                 | 250   | --   | --   | V          |
| Zero Gate Voltage Drain Current         | $I_{DSS}$     | $V_{DS} = 250V, V_{GS} = 0V, T_J = 25^{\circ}C$               | --    | --   | 1    | $\mu A$    |
| Gate-Source Leakage                     | $I_{GSS}$     | $V_{GS} = +20V, V_{DS}=0V$                                    | --    | --   | 100  | nA         |
|                                         |               | $V_{GS}=-20V, V_{DS}=0V$                                      | --    | --   | -100 |            |
| Gate-Source Threshold Voltage           | $V_{GS(th)}$  | $V_{DS} = V_{GS}, I_D = 250\mu A$                             | 2.0   | --   | 4.0  | V          |
| Drain-Source On-Resistance (Note3)      | $R_{DS(on)}$  | $V_{GS} = 10V, I_D = 25A$                                     | --    | 27   | 45   | m $\Omega$ |
| Dynamic                                 |               |                                                               |       |      |      |            |
| Input Capacitance                       | $C_{iss}$     | $V_{GS} = 0V,$<br>$V_{DS} = 25V,$<br>$f = 1.0MHz$             | --    | 3538 | --   | pF         |
| Output Capacitance                      | $C_{oss}$     |                                                               | --    | 657  | --   |            |
| Reverse Transfer Capacitance            | $C_{rss}$     |                                                               | --    | 280  | --   |            |
| Total Gate Charge                       | $Q_g$         | $V_{DD} = 160V, I_D = 25A,$<br>$V_{GS} = 0 \text{ to } 10V$   | --    | 244  | --   | nC         |
| Gate-Source Charge                      | $Q_{gs}$      |                                                               | --    | 16   | --   |            |
| Gate-Drain Charge                       | $Q_{gd}$      |                                                               | --    | 144  | --   |            |
| Turn-on Delay Time                      | $t_{d(on)}$   | $V_{DD} = 100V, I_D = 25A,$<br>$V_{GS} = 10V, R_G = 25\Omega$ | --    | 53   | --   | ns         |
| Turn-on Rise Time                       | $t_r$         |                                                               | --    | 65   | --   |            |
| Turn-off Delay Time                     | $t_{d(off)}$  |                                                               | --    | 689  | --   |            |
| Turn-off Fall Time                      | $t_f$         |                                                               | --    | 230  | --   |            |
| Drain-Source Body Diode Characteristics |               |                                                               |       |      |      |            |
| Continuous Body Diode Current           | $I_S$         | $T_C = 25^{\circ}C$                                           | --    | --   | 70   | A          |
| Pulsed Diode Forward Current            | $I_{SM}$      |                                                               | --    | --   | 280  |            |
| Body Diode Voltage                      | $V_{SD}$      | $T_J = 25^{\circ}C, I_{SD} = 25A, V_{GS} = 0V$                | --    | --   | 1.5  | V          |
| Reverse Recovery Time                   | $t_{rr}$      | $V_{GS} = 0V, I_S = 25A,$<br>$di_F/dt = 100A/\mu s$           | --    | 208  | --   | ns         |
| Reverse Recovery Charge                 | $Q_{rr}$      |                                                               | --    | 2.04 | --   | $\mu C$    |

**Notes**

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $I_{AS} = 30A, V_{DD} = 30V, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty Cycle  $\leq 1\%$

Typical Characteristics  $T_J = 25^\circ\text{C}$ , unless otherwise noted

Figure 1. Output Characteristics ( $T_J = 25^\circ\text{C}$ )

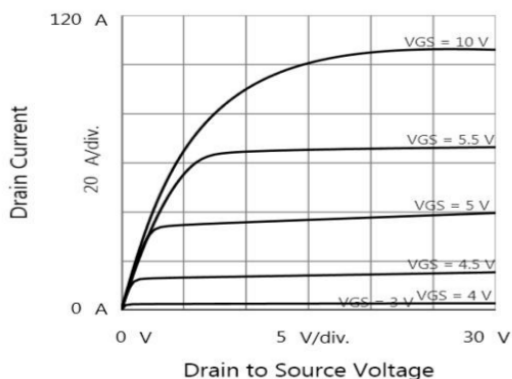


Figure 2. Transfer Characteristics

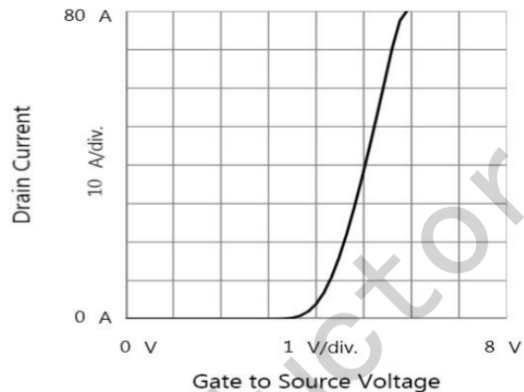


Figure 3. Maximum Continuous Drain Current vs Case Temperature

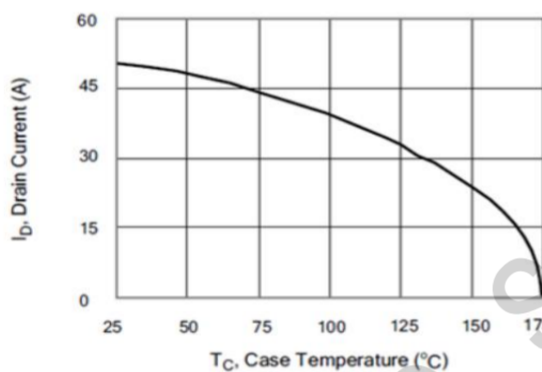


Figure 4. Drain to Source Voltage vs. Gate to Source Voltage

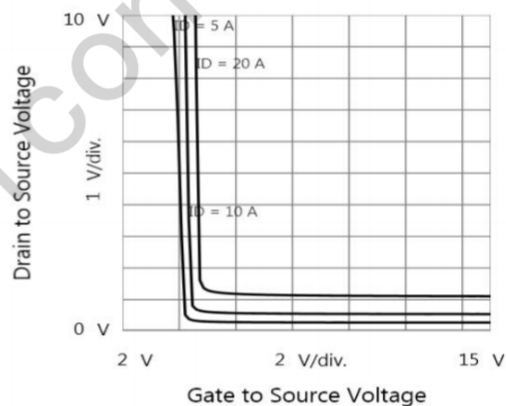


Figure 5. Typical Breakdown Voltage vs Junction Temperature

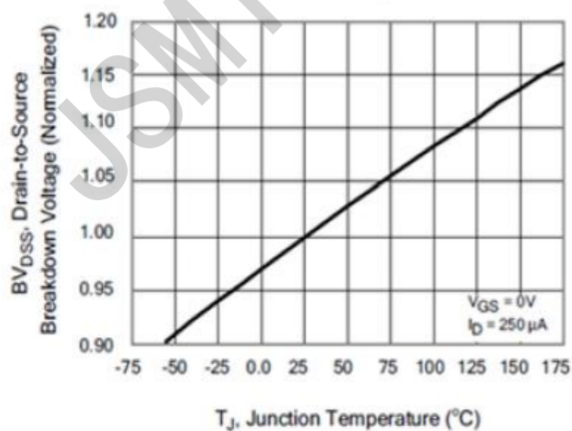
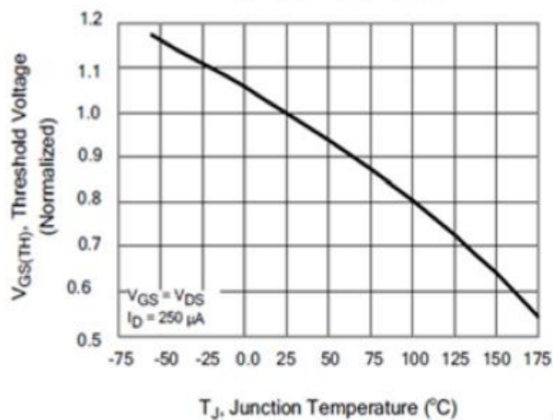


Figure 6. Typical Threshold Voltage vs Junction Temperature



Typical Characteristics  $T_J = 25^\circ\text{C}$ , unless otherwise noted

Figure 7. Capacitance

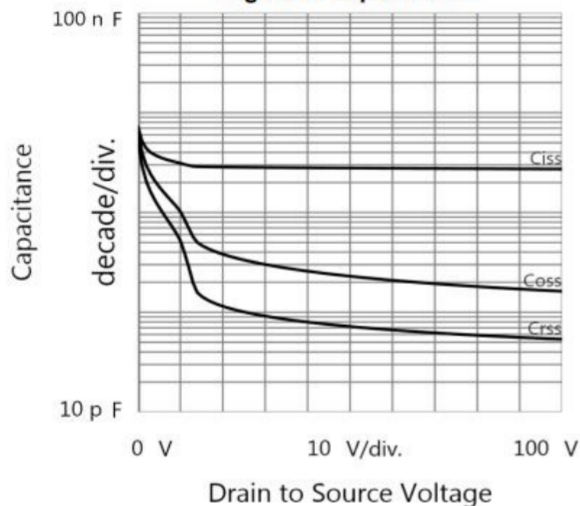


Figure 8. Gate Charge

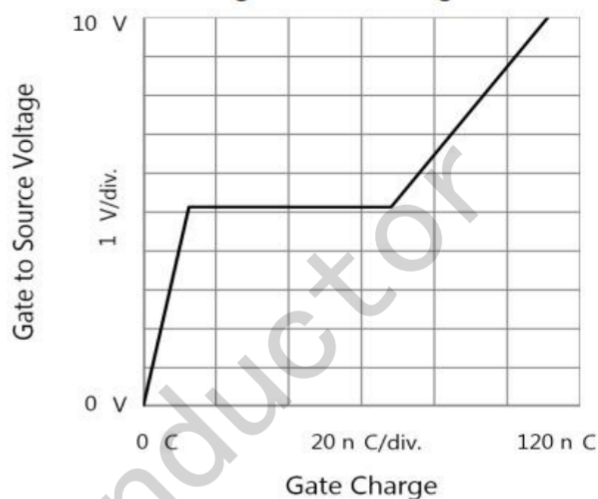


Figure 9. Transient Thermal Impedance  
TO-247, TO-3P

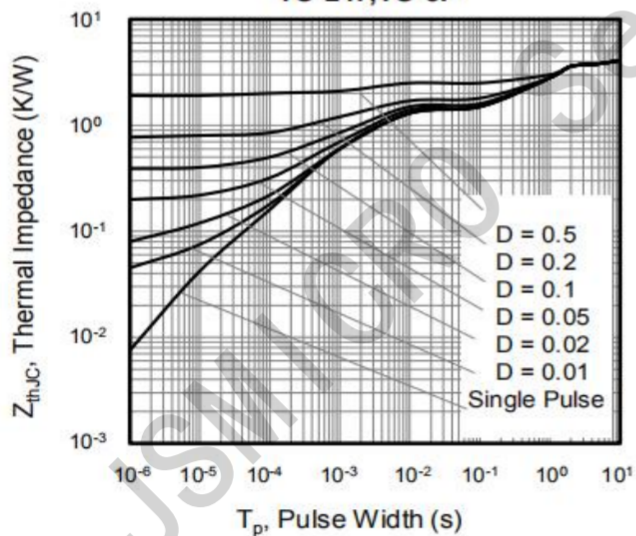


Figure 10. Maximum Forward Bias Safe  
Operating Area

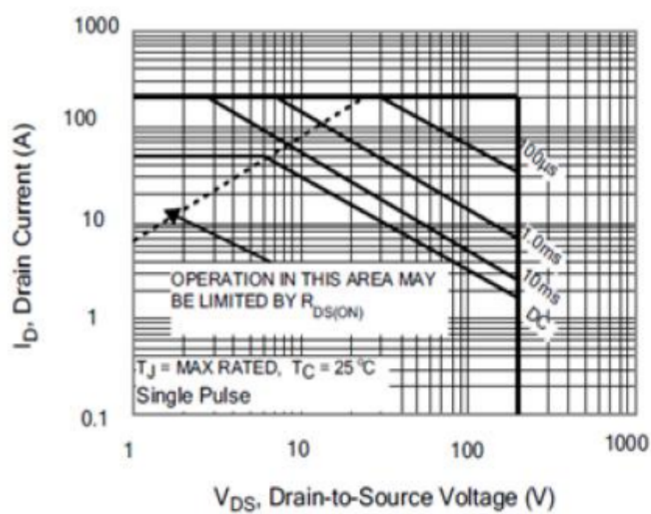


Figure A: Gate Charge Test Circuit and Waveform

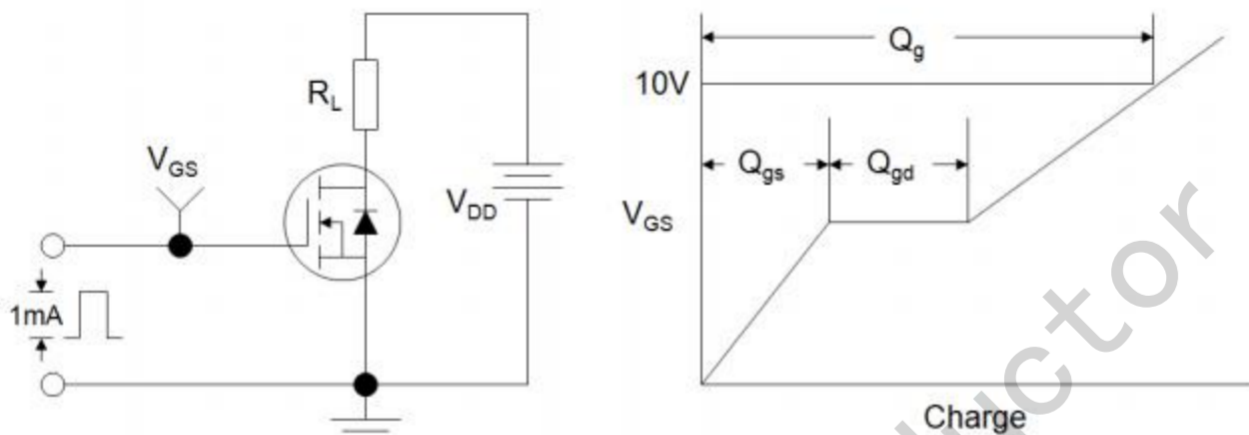


Figure B: Resistive Switching Test Circuit and Waveform

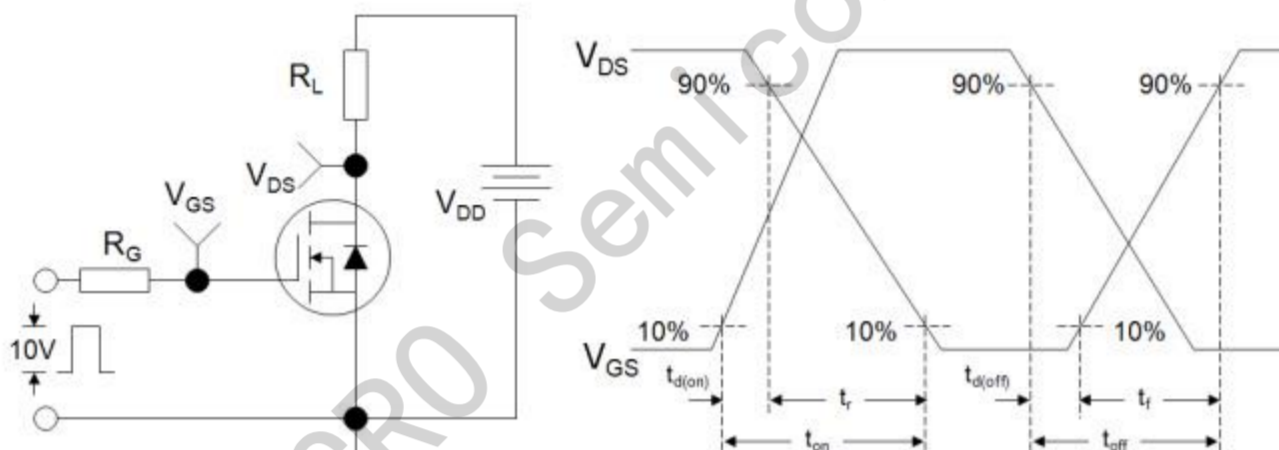
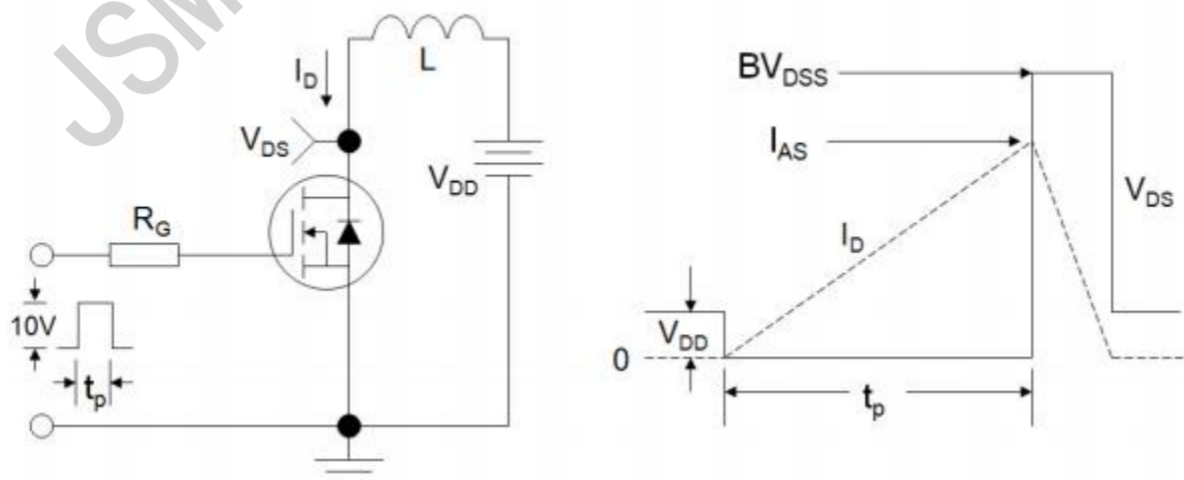
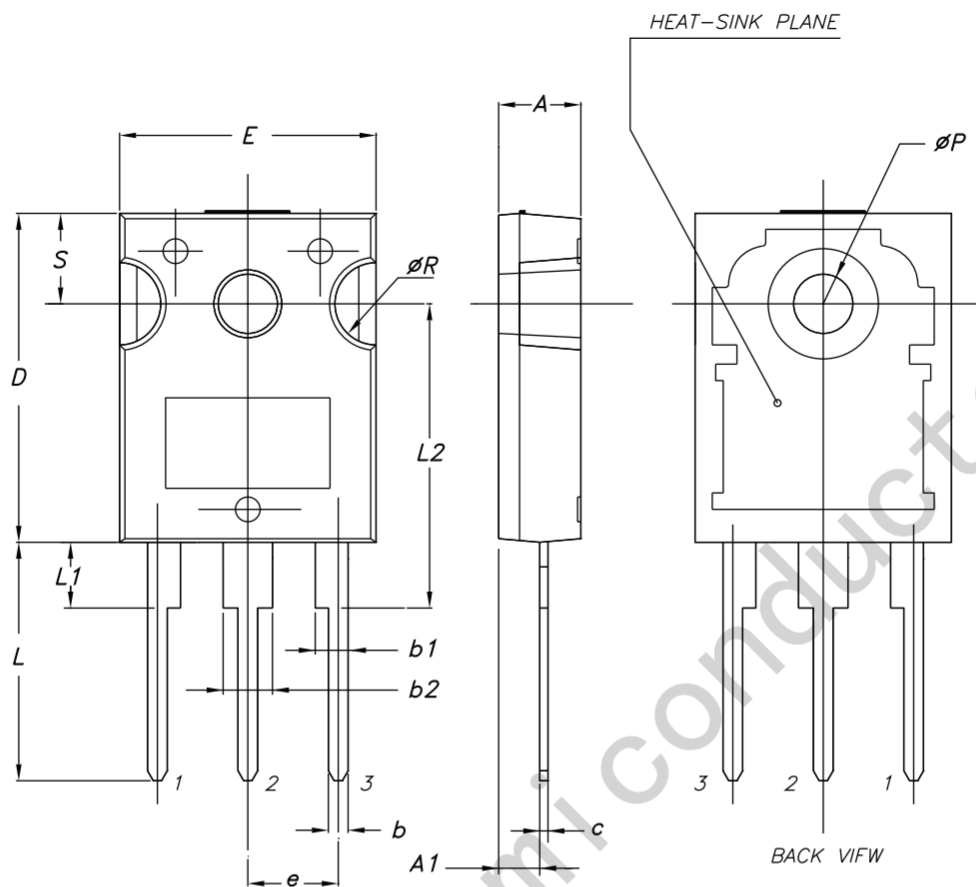


Figure C: Unclamped Inductive Switching Test Circuit and Waveform





| Dim. | mm.   |       |       |
|------|-------|-------|-------|
|      | Min.  | Typ.  | Max.  |
| A    | 4.85  |       | 5.15  |
| A1   | 2.20  |       | 2.60  |
| b    | 1.0   |       | 1.40  |
| b1   | 2.0   |       | 2.40  |
| b2   | 3.0   |       | 3.40  |
| c    | 0.40  |       | 0.80  |
| D    | 19.85 |       | 20.15 |
| E    | 15.45 |       | 15.75 |
| e    | 5.30  | 5.45  | 5.60  |
| L    | 14.20 |       | 14.80 |
| L1   | 3.70  |       | 4.30  |
| L2   |       | 18.50 |       |
| ØP   | 3.55  |       | 3.65  |
| ØR   | 4.50  |       | 5.50  |
| S    | 5.30  | 5.50  | 5.70  |