

# IXFN44N100P

## 1000 V, 220 mΩ Polar™ HiperFET™ Power MOSFET



### Features:

- International Standard Package
- Low Intrinsic Gate Resistance
- miniBLOC with Aluminum Nitride Isolation
- Low Package Inductance
- Fast Intrinsic Rectifier
- Low  $R_{DS(on)}$  and  $Q_G$

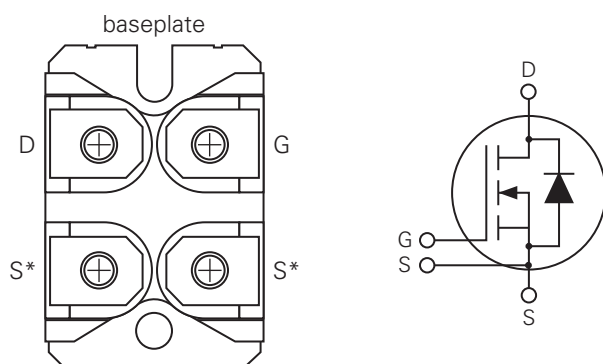
### Advantages:

- High Power Density
- Easy to Mount
- Space Savings

### Applications:

- DC-DC Converters
- Battery Chargers
- Switch-Mode and Resonant-Mode Power Supplies
- AC Motor Control
- High Speed Power Switching Application

### Pinout Diagram (SOT-227B)



**G:** Gate; **D:** Drain; **S:** Source; **baseplate:** Isolated

\* Either Source terminal can be used as main or Kelvin Source

### Product Summary

| Characteristic | Value      | Unit |
|----------------|------------|------|
| $V_{DSS}$      | 1000       | V    |
| $I_{D25}$      | 37         | A    |
| $R_{DS(on)}$   | $\leq 220$ | mΩ   |
| $t_{rr}$       | $\leq 300$ | ns   |

## Maximum Ratings

| Symbol            | Characteristics                | Conditions                                                                                     |           | Value       | Units    |
|-------------------|--------------------------------|------------------------------------------------------------------------------------------------|-----------|-------------|----------|
| V <sub>DSS</sub>  | Drain-Source Voltage           | T <sub>J</sub> = 25°C to 150°C                                                                 |           | 1000        | V        |
| V <sub>DGR</sub>  | Drain-Gate Voltage             | T <sub>J</sub> = 25°C to 150°C, R <sub>GS</sub> = 1 mΩ                                         |           | 1000        | V        |
| V <sub>GSS</sub>  | Gate-Source Voltage            | Continuous                                                                                     |           | ±30         | V        |
| V <sub>GSM</sub>  |                                | Transient                                                                                      |           | ±40         |          |
| I <sub>D25</sub>  | Drain Current                  | T <sub>C</sub> = 25°C                                                                          |           | 37          | A        |
| I <sub>DM</sub>   |                                | T <sub>C</sub> = 25°C, Pulse width limited by T <sub>JM</sub>                                  |           | 110         |          |
| I <sub>A</sub>    | Avalanche Current              | T <sub>C</sub> = 25°C                                                                          |           | 22          | A        |
| E <sub>AS</sub>   | Avalanche Energy               | T <sub>C</sub> = 25°C                                                                          |           | 2           | J        |
| dV/dt             | Reverse Diode dV/dt            | I <sub>S</sub> ≤ I <sub>DM</sub> , V <sub>DD</sub> ≤ V <sub>DSS</sub> , T <sub>J</sub> ≤ 150°C |           | 20          | V/ns     |
| P <sub>D</sub>    | Power Dissipation              | T <sub>C</sub> = 25°C                                                                          |           | 890         | W        |
| T <sub>J</sub>    | Operating Junction Temperature | –                                                                                              |           | -55 to +150 | °C       |
| T <sub>JM</sub>   | Maximum Junction Temperature   | –                                                                                              |           | 150         |          |
| T <sub>stg</sub>  | Storage Temperature            | –                                                                                              |           | -55 to +150 |          |
| V <sub>ISOL</sub> | Isolation Voltage              | 50/60 Hz, RMS, I <sub>ISOL</sub> ≤ 1 mA                                                        | t = 1 min | 2500        | V~       |
|                   |                                |                                                                                                | t = 1 s   | 3000        |          |
| M <sub>d</sub>    | Mounting Torque for Base Plate | –                                                                                              |           | 1.5/13      | Nm/lb.in |
|                   | Terminal Connection Torque     | –                                                                                              |           | 1.3/11.5    | Nm/lb.in |
| W                 | Weight                         | –                                                                                              |           | 30          | g        |

## Thermal Characteristics

| Symbol       | Characteristic                        | Value |      |      | Unit                      |
|--------------|---------------------------------------|-------|------|------|---------------------------|
|              |                                       | Min.  | Typ. | Max. |                           |
| $R_{th, JC}$ | Thermal Resistance, junction-to-case  | –     | –    | 0.14 | $^\circ\text{C}/\text{W}$ |
| $R_{th, CS}$ | Thermal Resistance, case to heat sink | –     | 0.05 | –    | $^\circ\text{C}/\text{W}$ |

## Electrical Characteristics – Static ( $T_J = 25^\circ\text{C}$ unless otherwise specified)

| Symbol       | Characteristic                          | Conditions                                                             | Value |      |           | Unit          |
|--------------|-----------------------------------------|------------------------------------------------------------------------|-------|------|-----------|---------------|
|              |                                         |                                                                        | Min.  | Typ. | Max.      |               |
| $BV_{DSS}$   | Drain-Source Breakdown Voltage          | $I_D = 3\text{ mA}$ , $V_{GS} = 0\text{ V}$                            | 1000  | –    | –         | V             |
| $V_{GS(th)}$ | Gate Threshold Voltage                  | $I_D = 1\text{ mA}$ , $V_{GS} = V_{DS}$                                | 3.5   | –    | 6.5       | V             |
| $I_{GSS}$    | Gate-Source Leakage Current             | $V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 30\text{ V}$                     | –     | –    | $\pm 200$ | nA            |
| $I_{DSS}$    | Drain-Source Current                    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0\text{ V}$                             | –     | –    | 50        | $\mu\text{A}$ |
|              |                                         | $V_{DS} = V_{DSS}$ , $V_{GS} = 0\text{ V}$ , $T_J = 125^\circ\text{C}$ | –     | –    | 3         | mA            |
| $R_{DS(on)}$ | Drain-Source On-Resistance <sup>1</sup> | $V_{GS} = 10\text{ V}$ , $I_D = 22\text{ A}$                           | –     | –    | 220       | m $\Omega$    |

**Note 1:** Pulse test,  $t \leq 300\text{ }\mu\text{s}$ , duty cycle,  $d \leq 2\%$

**Electrical Characteristics – Dynamic** ( $T_J = 25^\circ\text{C}$  unless otherwise specified)

| Symbol       | Characteristic                | Conditions                                                                                                                        | Value |      |      | Unit     |
|--------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------|------|------|----------|
|              |                               |                                                                                                                                   | Min.  | Typ. | Max. |          |
| $g_{fs}$     | Transconductance <sup>1</sup> | $V_{DS} = 20\text{ V}, I_D = 22\text{ A}$                                                                                         | 20    | 35   | –    | S        |
| $R_{Gi}$     | Gate Input Resistance         | –                                                                                                                                 | –     | 1.4  | –    | $\Omega$ |
| $C_{iss}$    | Input Capacitance             | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$                                                                     | –     | 16.9 | –    | nF       |
| $C_{oss}$    | Output Capacitance            |                                                                                                                                   | –     | 1100 | –    | pF       |
| $C_{rss}$    | Reverse Transfer Capacitance  |                                                                                                                                   | –     | 184  | –    | pF       |
| $Q_{g(on)}$  | Total Gate Charge             | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 \times V_{DSS},$<br>$I_D = 22\text{ A}$                                                       | –     | 350  | –    | nC       |
| $Q_{gs}$     | Gate-Source Charge            |                                                                                                                                   | –     | 104  | –    |          |
| $Q_{gd}$     | Gate-Drain Charge             |                                                                                                                                   | –     | 126  | –    |          |
| $t_{d(on)}$  | Turn-on Delay Time            | <b>Resistive Switching</b><br>$V_{GS} = 10\text{ V}, V_{DS} = 0.5 \times V_{DSS},$<br>$I_D = 22\text{ A}, R_{G(ext)} = 1\ \Omega$ | –     | 60   | –    | ns       |
| $t_r$        | Rise Time                     |                                                                                                                                   | –     | 68   | –    |          |
| $t_{d(off)}$ | Turn-off Delay Time           |                                                                                                                                   | –     | 90   | –    |          |
| $t_f$        | Fall Time                     |                                                                                                                                   | –     | 54   | –    |          |

**Note 1:** Pulse test,  $t \leq 300\ \mu\text{s}$ , duty cycle,  $d \leq 2\%$

**Source-Drain Diode Characteristics** ( $T_J = 25^\circ\text{C}$  unless otherwise specified)

| Symbol   | Characteristic                     | Conditions                                                                                           | Value |      |      | Unit          |
|----------|------------------------------------|------------------------------------------------------------------------------------------------------|-------|------|------|---------------|
|          |                                    |                                                                                                      | Min.  | Typ. | Max. |               |
| $I_S$    | Continuous Diode Forward Current   | $V_{GS} = 0\text{ V}$                                                                                | –     | –    | 44   | A             |
| $I_{SM}$ | Diode Pulse Current                | Repetitive, Pulse width limited by $T_{JM}$                                                          | –     | –    | 176  | A             |
| $V_{SD}$ | Diode Forward Voltage <sup>1</sup> | $I_F = I_S, V_{GS} = 0\text{ V}$                                                                     | –     | –    | 1.5  | V             |
| $t_{rr}$ | Reverse Recovery Time              | $I_F = 22\text{ A}, -di/dt = 100\text{ A}/\mu\text{s},$<br>$V_r = 100\text{ V}, V_{GS} = 0\text{ V}$ | –     | –    | 300  | ns            |
| $Q_{rm}$ | Reverse Recovery Charge            |                                                                                                      | –     | 2.5  | –    | $\mu\text{C}$ |
| $I_{rm}$ | Reverse Recovery Current           |                                                                                                      | –     | 17.0 | –    | A             |

**Note 1:** Pulse test,  $t \leq 300\ \mu\text{s}$ , duty cycle,  $d \leq 2\%$

## Characteristic Curves

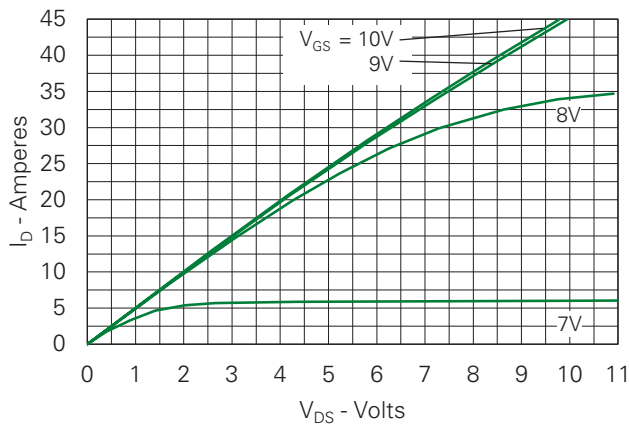
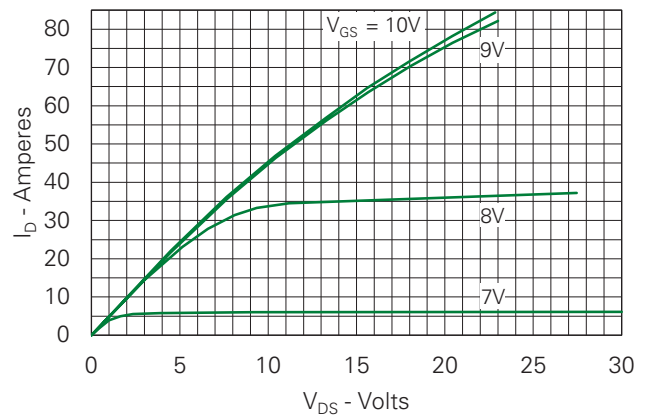
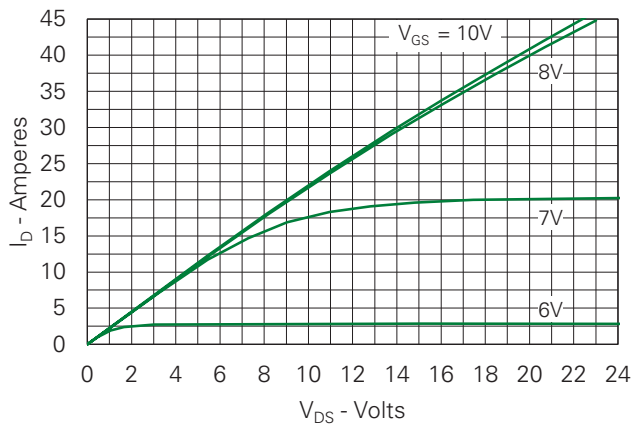
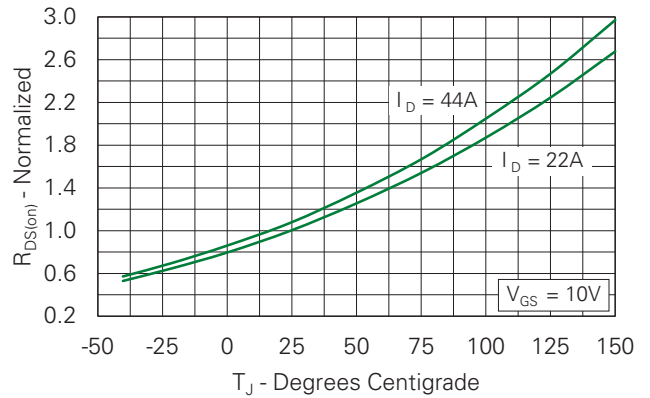
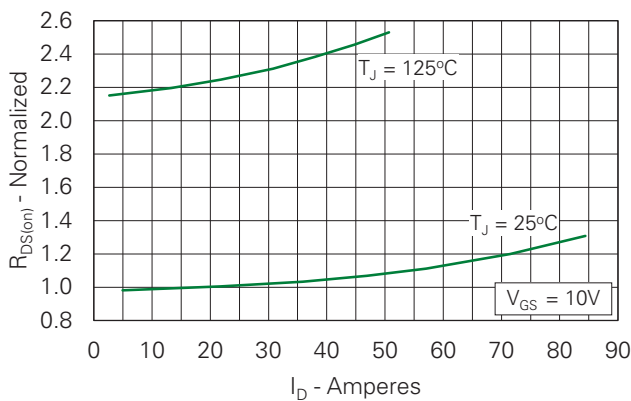
Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$ Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$ Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$ Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 22\text{A}$  Value vs. Junction TemperatureFig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 22\text{A}$  Value vs. Drain Current

Fig. 6. Maximum Drain Current vs. Case Temperature

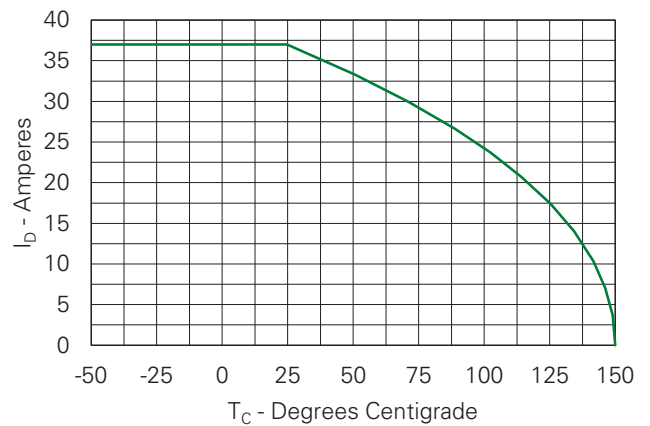


Fig. 7. Input Admittance

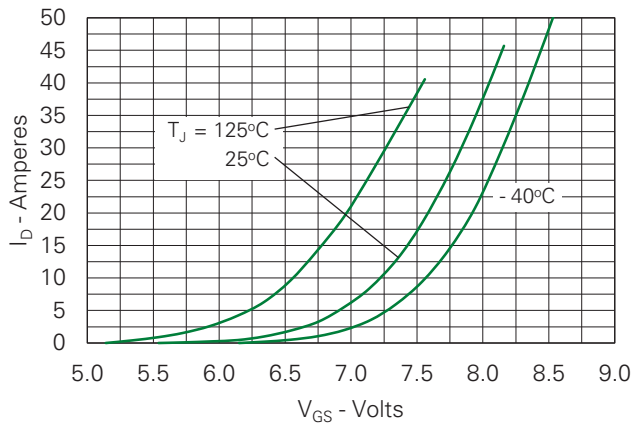


Fig. 8. Transconductance

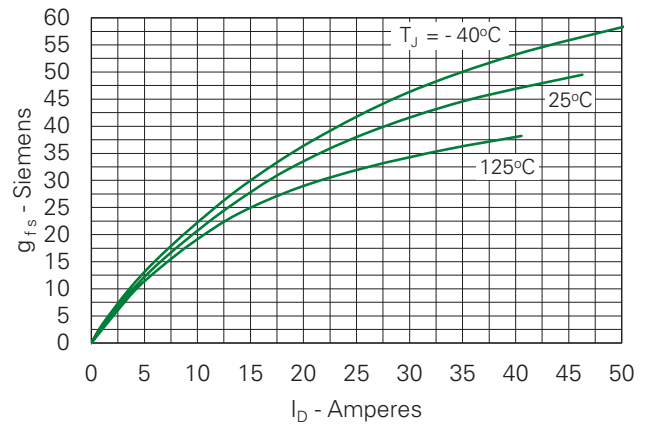


Fig. 9. Forward Voltage Drop of Intrinsic Diode

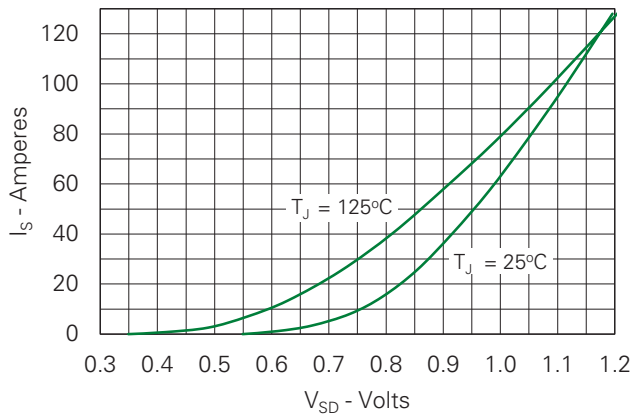


Fig. 10. Gate Charge

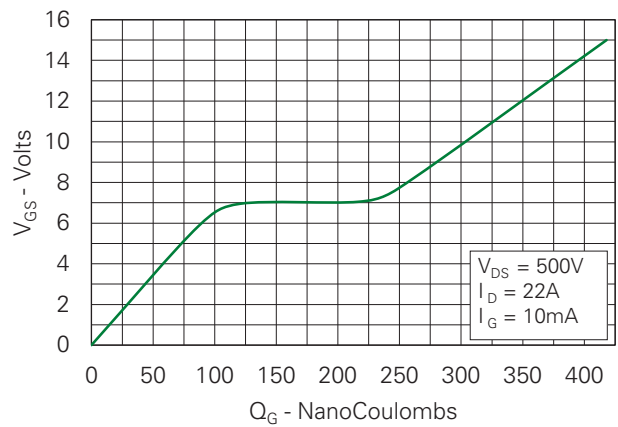


Fig. 11. Capacitance

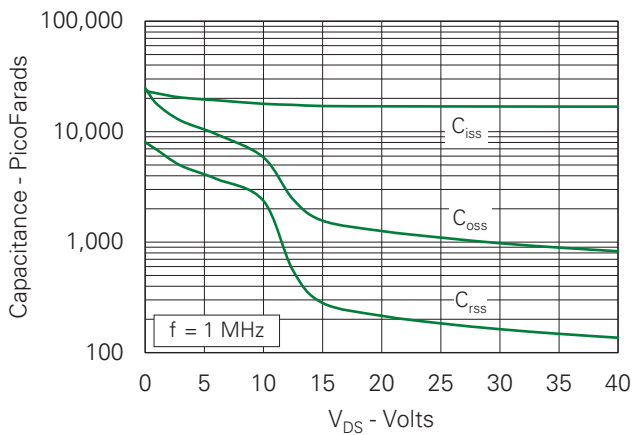
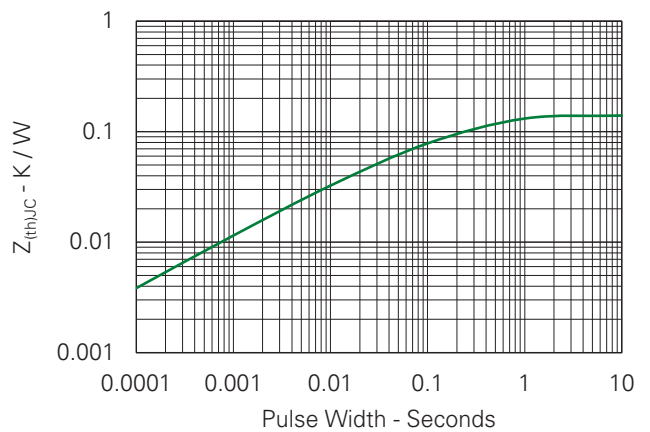
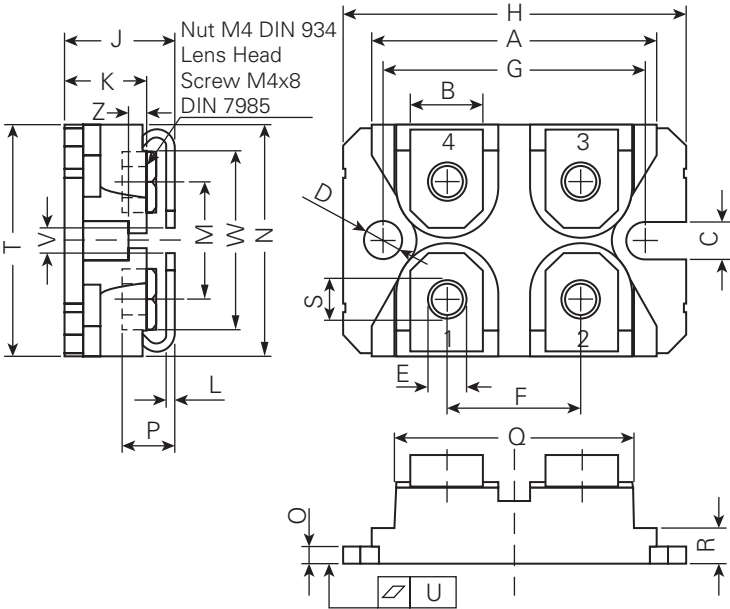


Fig. 12. Maximum Transient Thermal Impedance



Part Outline Drawing (SOT-227B)



| Symbol | Inches  |       | Millimeters |       |
|--------|---------|-------|-------------|-------|
|        | Min.    | Max.  | Min.        | Max   |
| A      | 1.240   | 1.255 | 31.50       | 31.88 |
| B      | 0.307   | 0.323 | 7.80        | 8.20  |
| C      | 0.161   | 0.169 | 4.09        | 4.29  |
| D      | 0.161   | 0.169 | 4.09        | 4.29  |
| E      | 0.161   | 0.169 | 4.09        | 4.29  |
| F      | 0.587   | 0.595 | 14.91       | 15.11 |
| G      | 1.186   | 1.193 | 30.12       | 30.30 |
| H      | 1.488   | 1.505 | 37.80       | 38.23 |
| J      | 0.460   | 0.481 | 11.68       | 12.22 |
| K      | 0.351   | 0.378 | 8.92        | 9.60  |
| L      | 0.029   | 0.033 | 0.74        | 0.84  |
| M      | 0.492   | 0.516 | 12.50       | 13.10 |
| N      | 0.990   | 1.001 | 25.15       | 25.42 |
| O      | 0.077   | 0.084 | 1.95        | 2.13  |
| P      | 0.195   | 0.244 | 4.95        | 6.20  |
| Q      | 1.045   | 1.059 | 26.54       | 26.90 |
| R      | 0.155   | 0.167 | 3.94        | 4.42  |
| S      | 0.179   | 0.191 | 4.55        | 4.85  |
| T      | 0.968   | 0.994 | 24.59       | 25.25 |
| U      | - 0.002 | 0.004 | -0.05       | 0.10  |
| V      | 0.126   | 0.217 | 3.20        | 5.50  |
| W      | 0.780   | 0.830 | 19.81       | 21.08 |
| Z      | .098    | 0.106 | 2.50        | 2.70  |

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