



STE250NS10

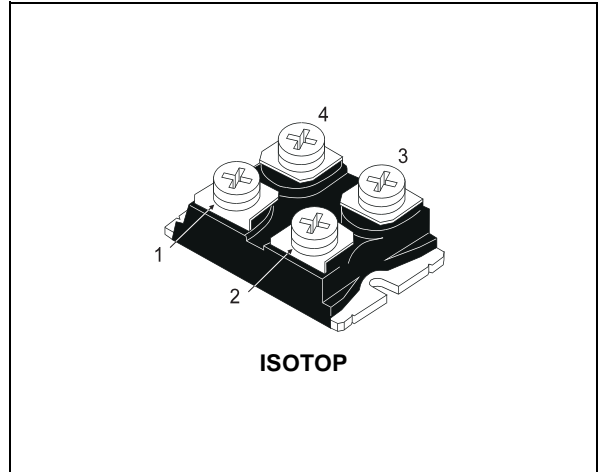
N-CHANNEL 100V - 0.0045 Ω - 220A ISOTOP STripFET™ POWER MOSFET

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|------------|------------------|---------------------|----------------|
| STE250NS10 | 100 V | <0.0055 Ω | 220A |

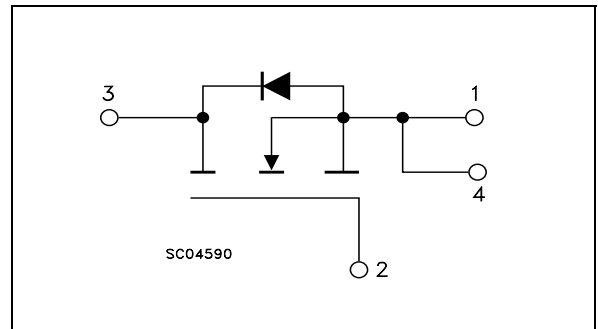
- TYPICAL R_{DS(on)} = 0.0045Ω
- STANDARD THRESHOLD DRIVE
- 100% AVALANCHE TESTED

APPLICATIONS

- SMPS & UPS
- MOTOR CONTROL
- WELDING EQUIPMENT
- OUTPUT STAGE FOR PWM, ULTRASONIC CIRCUITS



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---------------------|--|------------|------|
| V _{DS} | Drain-source Voltage (V _{GS} = 0) | 100 | V |
| V _{DGR} | Drain-gate Voltage (R _{GS} = 20 kΩ) | 100 | V |
| V _{GS} | Gate- source Voltage | ± 20 | V |
| I _D | Drain Current (continuous) at T _C = 25°C | 220 | A |
| I _D | Drain Current (continuous) at T _C = 100°C | 156 | A |
| I _{DM} (●) | Drain Current (pulsed) | 880 | A |
| P _{tot} | Total Dissipation at T _C = 25°C | 500 | W |
| | Derating Factor | 4 | W/°C |
| dv/dt (1) | Peak Diode Recovery voltage slope | 3.5 | V/ns |
| V _{ISO} | Insulation Withstand Voltage (AC-RMS) | 2500 | V |
| T _{stg} | Storage Temperature | -55 to 150 | °C |
| T _j | Operating Junction Temperature | 150 | °C |

(●) Pulse width limited by safe operating area.

(1) I_{SD} ≤ 220A, di/dt ≤ 200A/μs, V_{DD} ≤ V(BR)DSS, T_j ≤ T_{JMAX}.

STE250NS10

THERMAL DATA

| | | | | |
|-----------|-------------------------------------|-----|------|------|
| Rthj-case | Thermal Resistance Junction-case | Max | 0.25 | °C/W |
| Rthj-amb | Thermal Resistance Junction-ambient | Max | 50 | °C/W |

AVALANCHE CHARACTERISTICS

| Symbol | Parameter | Max Value | Unit |
|----------|--|-----------|------|
| I_{AR} | Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max) | 220 | A |
| E_{AS} | Single Pulse Avalanche Energy (starting $T_j = 25\text{ °C}$, $I_D = I_{AR}$, $V_{DD} = 64\text{ V}$) | 800 | mJ |

ELECTRICAL CHARACTERISTICS ($T_{case} = 25\text{ °C}$ unless otherwise specified)

OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|--|--|------|------|-----------|--------------------------------|
| $V_{(BR)DSS}$ | Drain-source Breakdown Voltage | $I_D = 1\text{ mA}$ $V_{GS} = 0$ | 100 | | | V |
| I_{DSS} | Zero Gate Voltage Drain Current ($V_{GS} = 0$) | $V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}$ $T_C = 125\text{ °C}$ | | | 50 500 | μA μA |
| I_{GSS} | Gate-body Leakage Current ($V_{DS} = 0$) | $V_{GS} = \pm 20\text{ V}$ | | | ± 400 | nA |

ON (*)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|-----------------------------------|--|------|--------|--------|----------|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}$ $I_D = 250\text{ }\mu\text{A}$ | 2 | 3 | 4 | V |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS} = 10\text{ V}$ $I_D = 125\text{ A}$ | | 0.0045 | 0.0055 | Ω |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------------|---|--|------|------------------|------|----------------|
| g_{fs} | Forward Transconductance | $V_{DS} = 20\text{ V}$ $I_D = 70\text{ A}$ | | 60 | | S |
| C_{iss} C_{oss} C_{rss} | Input Capacitance Output Capacitance Reverse Transfer Capacitance | $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$ | | 31 4.3 1.2 | | nF nF nF |

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------|--|---|------|-------------------|------|----------------|
| $t_{d(on)}$ t_r | Turn-on Delay Time Rise Time | $V_{DD} = 50\text{ V}$ $I_D = 125\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Resistive Load, Figure 3) | | 110 380 | | ns ns |
| Q_g Q_{gs} Q_{gd} | Total Gate Charge Gate-Source Charge Gate-Drain Charge | $V_{DD} = 50\text{ V}$ $I_D = 220\text{ A}$ $V_{GS} = 10\text{ V}$ | | 900 160 330 | | nC nC nC |

SWITCHING OFF

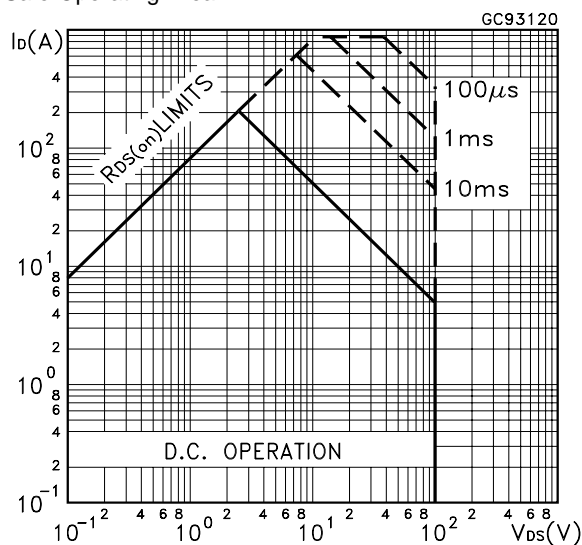
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------------------------|---|--|------|-------------------|------|----------------|
| $t_{d(off)}$ t_f | Turn-off Delay Time Fall Time | $V_{DD} = 50\text{ V}$ $I_D = 125\text{ A}$ $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ (Resistive Load, Figure 3) | | 1100 330 | | ns ns |
| $t_r(V_{off})$ t_f t_c | Off-voltage Rise Time Fall Time Cross-over Time | $V_{clamp} = 80\text{ V}$ $I_D = 220\text{ A}$ $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ (Inductive Load, Figure 5) | | 950 330 600 | | ns ns ns |

SOURCE DRAIN DIODE

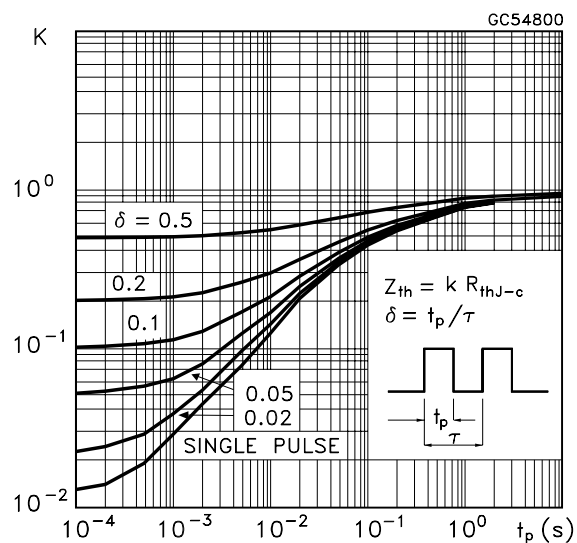
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------------------------------|--|--|------|---------------------|------------|--------------------------|
| I_{SD} $I_{SDM} (*)$ | Source-drain Current Source-drain Current (pulsed) | | | | 220 880 | A A |
| $V_{SD} (*)$ | Forward On Voltage | $I_{SD} = 220\text{ A}$ $V_{GS} = 0$ | | | 1.5 | V |
| t_{rr} Q_{rr} I_{RRM} | Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current | $I_{SD} = 220\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 30\text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, Figure 5) | | 200 1.35 13.5 | | ns μC A |

(*)Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.
(●)Pulse width limited by safe operating area.

Safe Operating Area

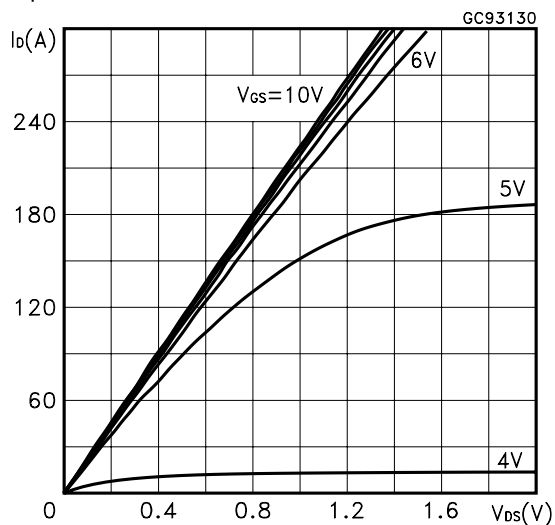


Thermal Impedance

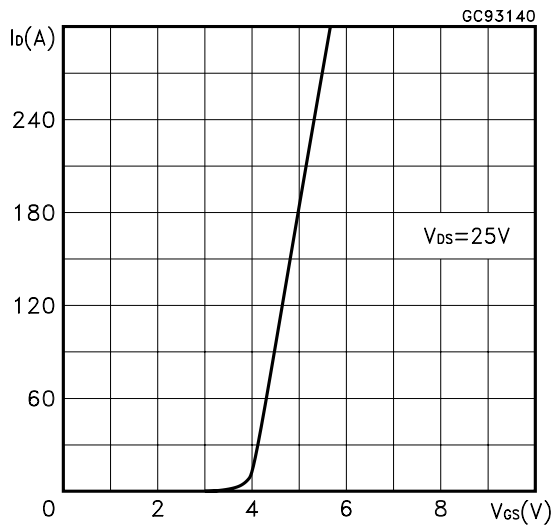


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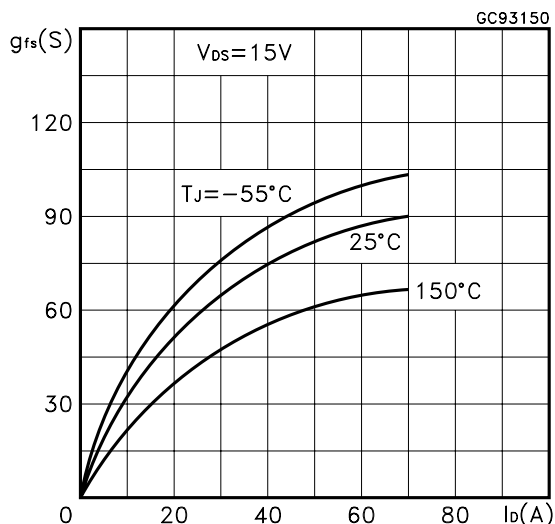
Output Characteristics



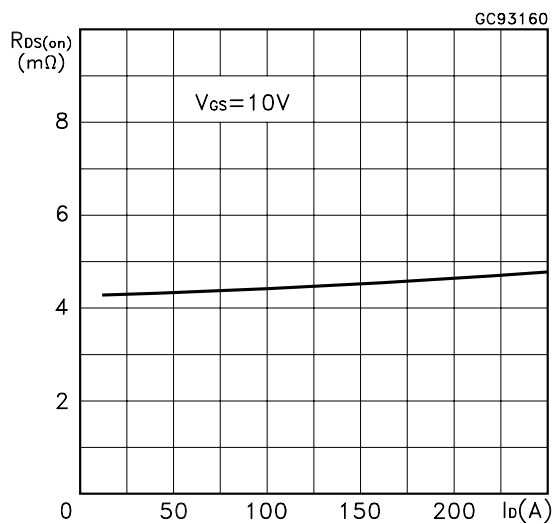
Transfer Characteristics



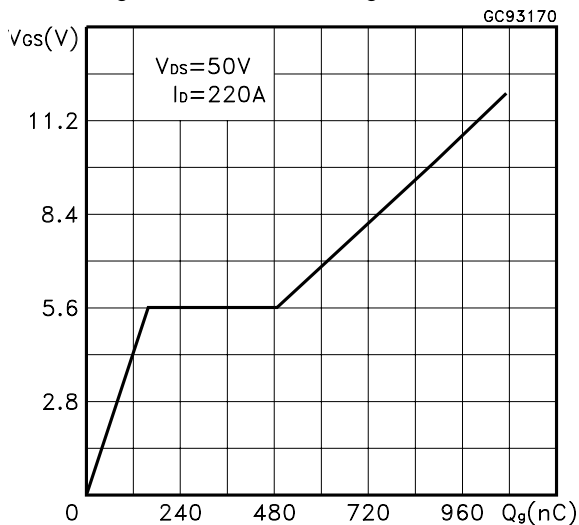
Transconductance



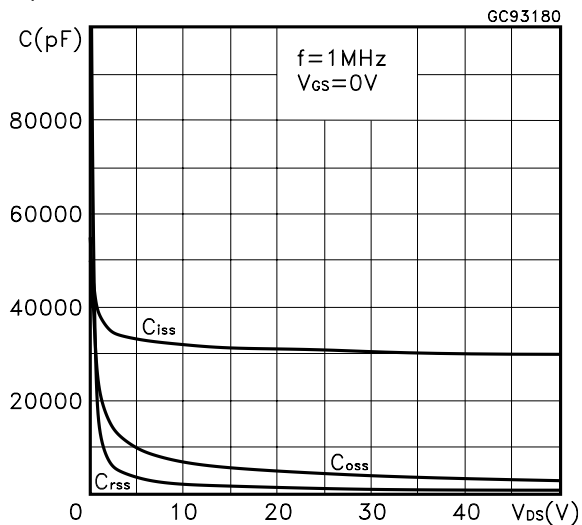
Static Drain-source On Resistance



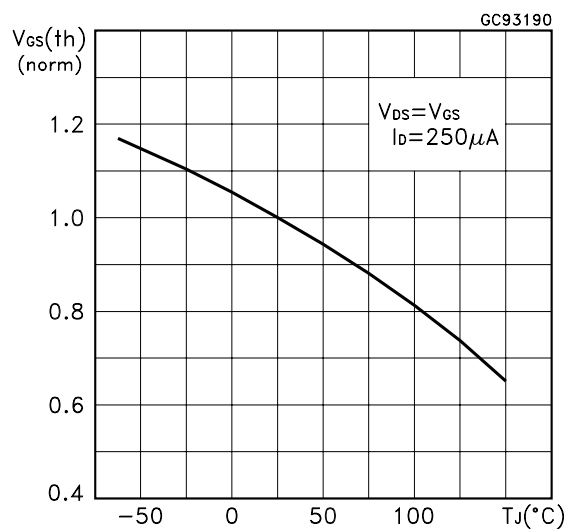
Gate Charge vs Gate-source Voltage



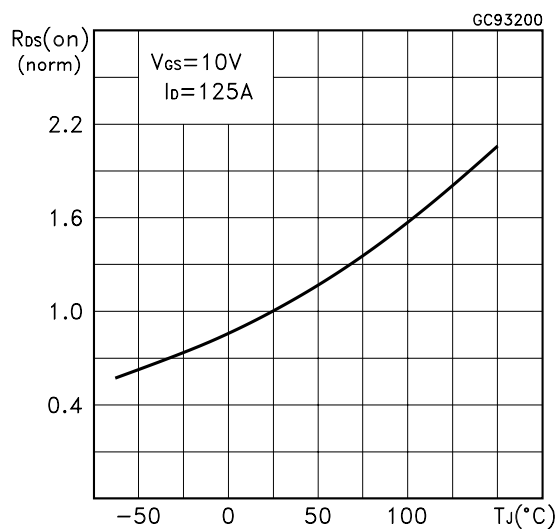
Capacitance Variations



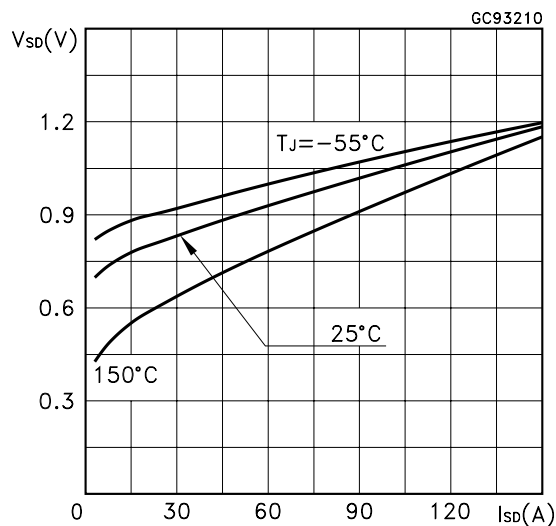
Normalized Gate Threshold Voltage vs Temperature



Normalized on Resistance vs Temperature



Source-drain Diode Forward Characteristics



Normalized Breakdown Voltage vs Temperature.

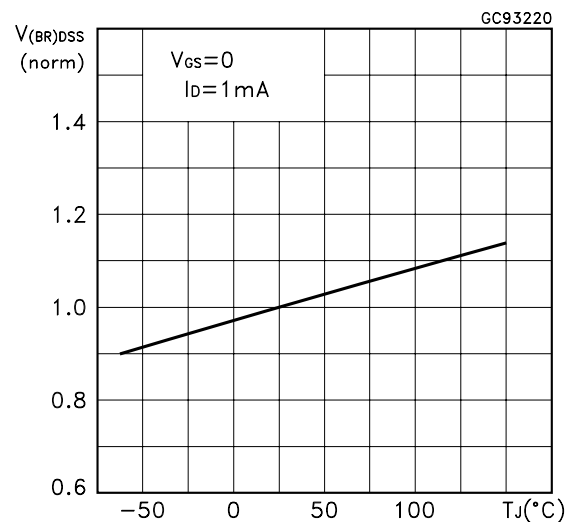


Fig. 1: Unclamped Inductive Load Test Circuit



Fig. 2: Unclamped Inductive Waveform



Fig. 3: Switching Times Test Circuits For Resistive Load



Fig. 4: Gate Charge test Circuit

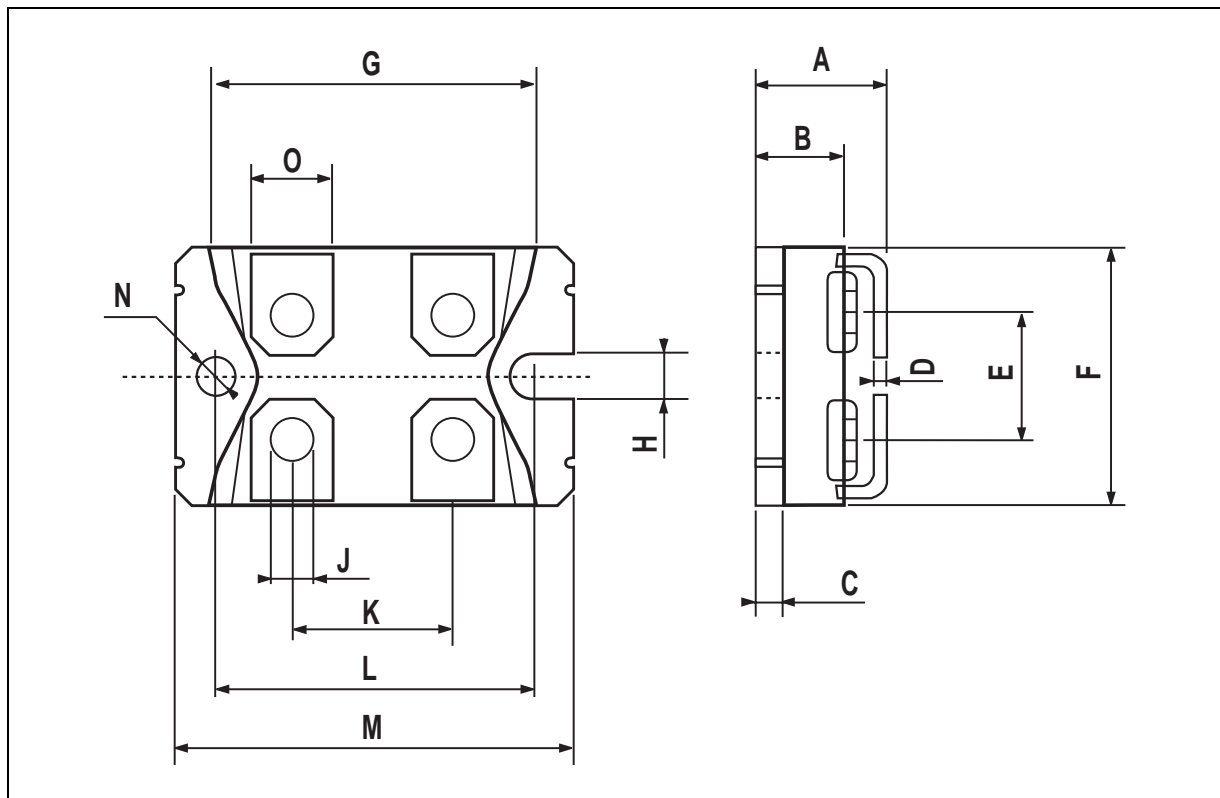


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



ISOTOP MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|-------|------|------|-------|------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 11.8 | | 12.2 | 0.466 | | 0.480 |
| B | 8.9 | | 9.1 | 0.350 | | 0.358 |
| C | 1.95 | | 2.05 | 0.076 | | 0.080 |
| D | 0.75 | | 0.85 | 0.029 | | 0.033 |
| E | 12.6 | | 12.8 | 0.496 | | 0.503 |
| F | 25.15 | | 25.5 | 0.990 | | 1.003 |
| G | 31.5 | | 31.7 | 1.240 | | 1.248 |
| H | 4 | | | 0.157 | | |
| J | 4.1 | | 4.3 | 0.161 | | 0.169 |
| K | 14.9 | | 15.1 | 0.586 | | 0.594 |
| L | 30.1 | | 30.3 | 1.185 | | 1.193 |
| M | 37.8 | | 38.2 | 1.488 | | 1.503 |
| N | 4 | | | 0.157 | | |
| O | 7.8 | | 8.2 | 0.307 | | 0.322 |



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