

## STN3NE06

### THERMAL DATA

|               |                                                          |     |     |               |
|---------------|----------------------------------------------------------|-----|-----|---------------|
| $R_{thj-pcb}$ | Thermal Resistance Junction-PC Board                     | Max | 50  | $^{\circ}C/W$ |
| $R_{thj-amb}$ | Thermal Resistance Junction-ambient<br>(Surface Mounted) | Max | 60  | $^{\circ}C/W$ |
| $T_l$         | Maximum Lead Temperature For Soldering Purpose           |     | 260 | $^{\circ}C$   |

### AVALANCHE CHARACTERISTICS

| Symbol   | Parameter                                                                                          | Max Value | Unit |
|----------|----------------------------------------------------------------------------------------------------|-----------|------|
| $I_{AR}$ | Avalanche Current, Repetitive or Not-Repetitive<br>(pulse width limited by $T_j$ max)              | 3         | A    |
| $E_{AS}$ | Single Pulse Avalanche Energy<br>(starting $T_j = 25^{\circ}C$ , $I_D = I_{AR}$ , $V_{DD} = 25$ V) | 20        | mJ   |

### ELECTRICAL CHARACTERISTICS ( $T_{case} = 25^{\circ}C$ unless otherwise specified)

#### OFF

| Symbol        | Parameter                                        | Test Conditions                                                                   | Min. | Typ. | Max.      | Unit               |
|---------------|--------------------------------------------------|-----------------------------------------------------------------------------------|------|------|-----------|--------------------|
| $V_{(BR)DSS}$ | Drain-source Breakdown Voltage                   | $I_D = 250 \mu A$ $V_{GS} = 0$                                                    | 60   |      |           | V                  |
| $I_{DSS}$     | Zero Gate Voltage Drain Current ( $V_{GS} = 0$ ) | $V_{DS} = \text{Max Rating}$<br>$V_{DS} = \text{Max Rating}$ $T_c = 125^{\circ}C$ |      |      | 1<br>10   | $\mu A$<br>$\mu A$ |
| $I_{GSS}$     | Gate-body Leakage Current ( $V_{DS} = 0$ )       | $V_{GS} = \pm 20$ V                                                               |      |      | $\pm 100$ | nA                 |

#### ON (\*)

| Symbol       | Parameter                         | Test Conditions                                              | Min. | Typ.  | Max.  | Unit     |
|--------------|-----------------------------------|--------------------------------------------------------------|------|-------|-------|----------|
| $V_{GS(th)}$ | Gate Threshold Voltage            | $V_{DS} = V_{GS}$ $I_D = 250 \mu A$                          | 2    | 3     | 4     | V        |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS} = 10$ V $I_D = 6$ A                                  |      | 0.080 | 0.100 | $\Omega$ |
| $I_{D(on)}$  | On State Drain Current            | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$<br>$V_{GS} = 10$ V | 3    |       |       | A        |

### DYNAMIC

| Symbol       | Parameter                    | Test Conditions                                         | Min. | Typ. | Max. | Unit |
|--------------|------------------------------|---------------------------------------------------------|------|------|------|------|
| $g_{fs} (*)$ | Forward Transconductance     | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 1.5$ A | 1    | 3    |      | S    |
| $C_{iss}$    | Input Capacitance            | $V_{DS} = 25$ V $f = 1$ MHz $V_{GS} = 0$ V              |      | 760  | 1000 | pF   |
| $C_{oss}$    | Output Capacitance           |                                                         |      | 100  | 140  | pF   |
| $C_{rss}$    | Reverse Transfer Capacitance |                                                         |      | 30   | 45   | pF   |

**ELECTRICAL CHARACTERISTICS** (continued)**SWITCHING ON**

| Symbol      | Parameter          | Test Conditions                                                   | Min. | Typ. | Max. | Unit |
|-------------|--------------------|-------------------------------------------------------------------|------|------|------|------|
| $t_{d(on)}$ | Turn-on Time       | $V_{DD} = 30\text{ V}$ $I_D = 6\text{ A}$                         |      | 10   | 15   | ns   |
| $t_r$       | Rise Time          | $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$                        |      | 35   | 50   | ns   |
| $Q_g$       | Total Gate Charge  | $V_{DD} = 40\text{ V}$ $I_D = 12\text{ A}$ $V_{GS} = 10\text{ V}$ |      | 20   | 25   | nC   |
| $Q_{gs}$    | Gate-Source Charge |                                                                   |      | 5    |      | nC   |
| $Q_{gd}$    | Gate-Drain Charge  |                                                                   |      | 7    |      | nC   |

**SWITCHING OFF**

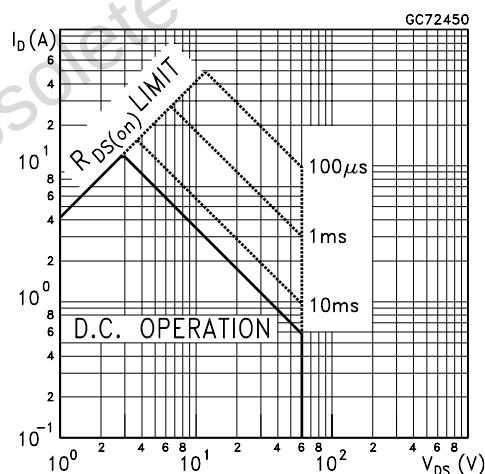
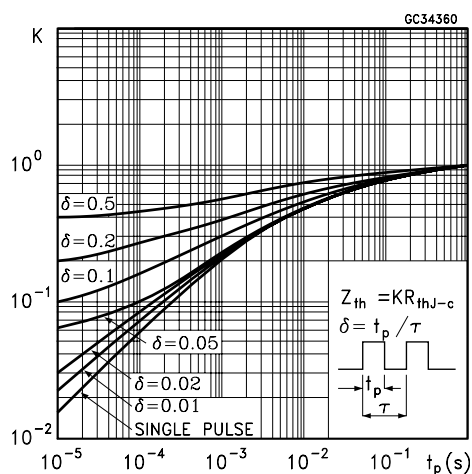
| Symbol        | Parameter             | Test Conditions                            | Min. | Typ. | Max. | Unit |
|---------------|-----------------------|--------------------------------------------|------|------|------|------|
| $t_{r(voff)}$ | Off-voltage Rise Time | $V_{DD} = 48\text{ V}$ $I_D = 12\text{ A}$ |      | 7    | 10   | ns   |
| $t_f$         | Fall Time             | $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ |      | 18   | 25   | ns   |
| $t_c$         | Cross-over Time       |                                            |      | 30   | 45   | ns   |

**SOURCE DRAIN DIODE**

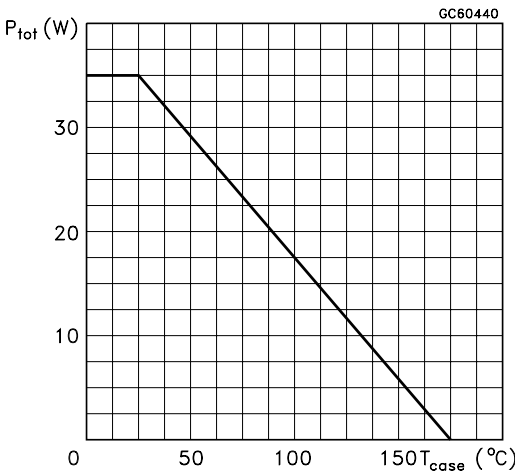
| Symbol             | Parameter                     | Test Conditions                                                                                                       | Min. | Typ. | Max. | Unit          |
|--------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| $I_{SD}$           | Source-drain Current          |                                                                                                                       |      |      | 3    | A             |
| $I_{SDM}(\bullet)$ | Source-drain Current (pulsed) |                                                                                                                       |      |      | 12   | A             |
| $V_{SD} (*)$       | Forward On Voltage            | $I_{SD} = 3\text{ A}$ $V_{GS} = 0$                                                                                    |      |      | 1.5  | V             |
| $t_{rr}$           | Reverse Recovery Time         | $I_{SD} = 12\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$<br>$V_{DD} = 30\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ |      | 65   |      | ns            |
| $Q_{rr}$           | Reverse Recovery Charge       |                                                                                                                       |      | 0.18 |      | $\mu\text{C}$ |
| $I_{RRM}$          | Reverse Recovery Current      |                                                                                                                       |      | 5.5  |      | A             |

(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

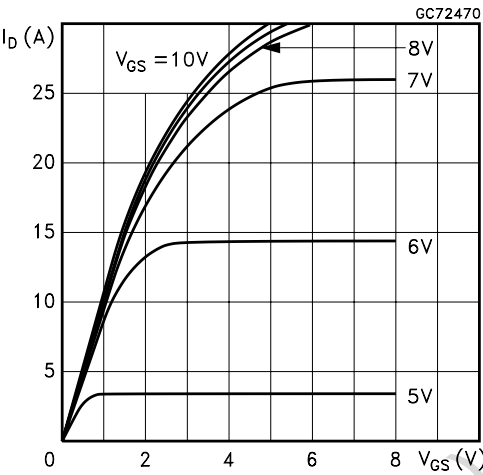
(•) Pulse width limited by safe operating area

**Safe Operating Area****Thermal Impedance**

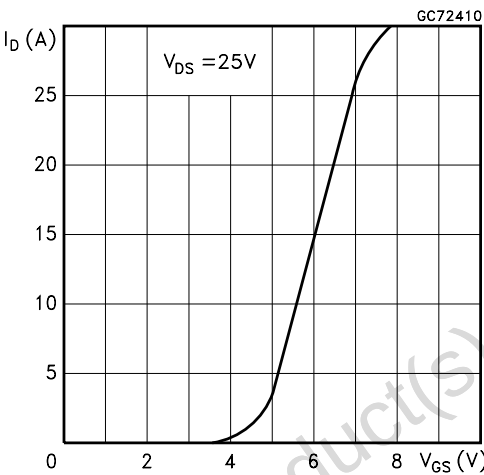
Derating Curve



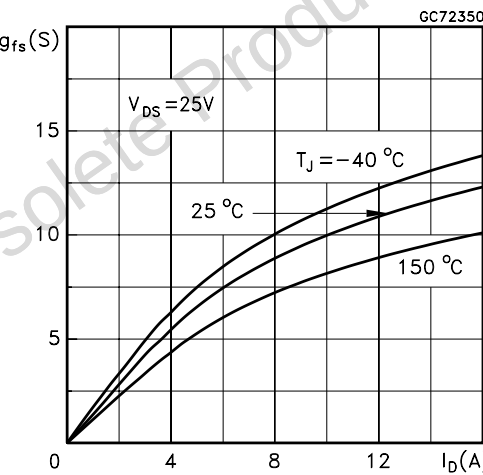
Output Characteristics



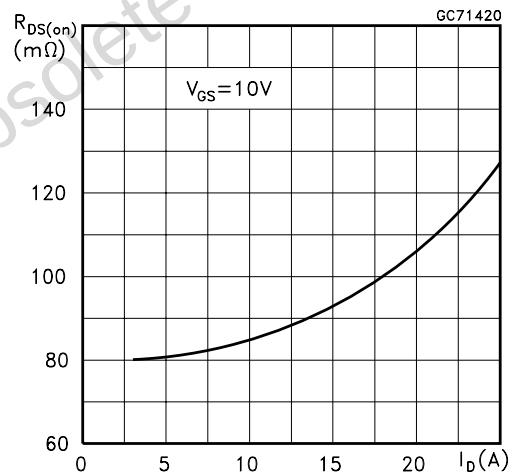
Transfer Characteristics



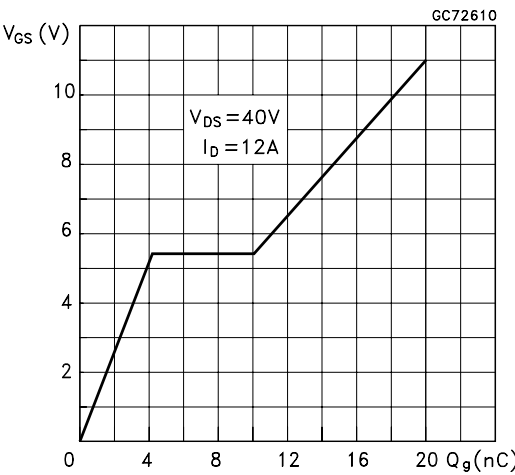
Transconductance



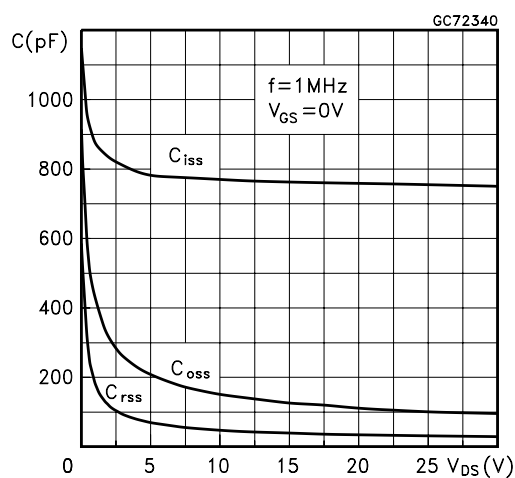
Static Drain-source On Resistance



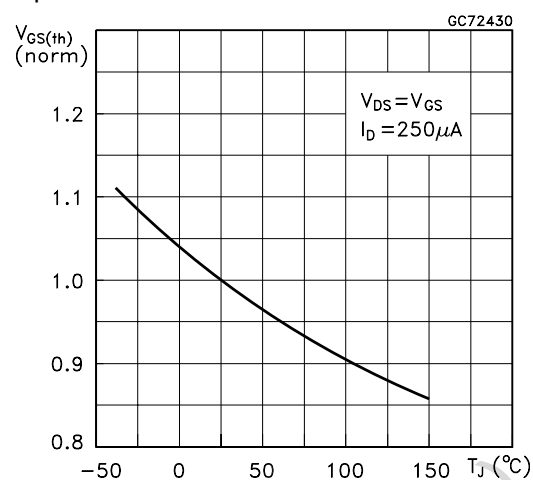
Gate Charge vs Gate-source Voltage



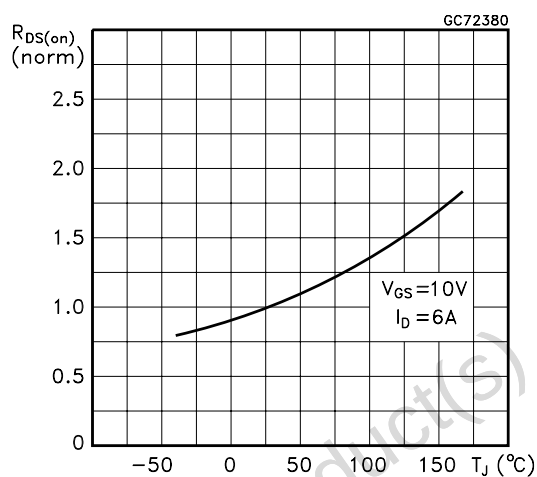
## Capacitance Variations



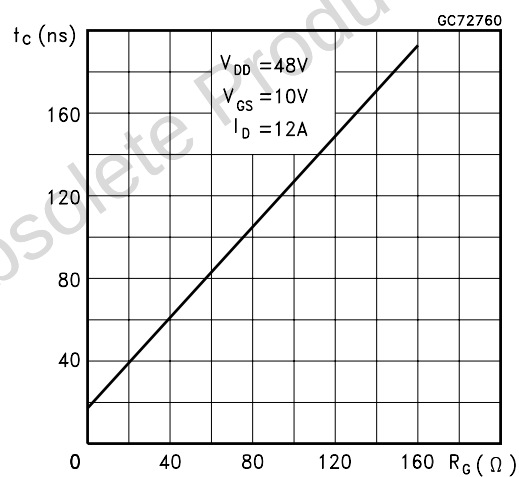
## Normalized Gate Threshold Voltage vs Temperature



## Normalized On Resistance vs Temperature



## Cross-over Time



## Source-drain Diode Forward Characteristics

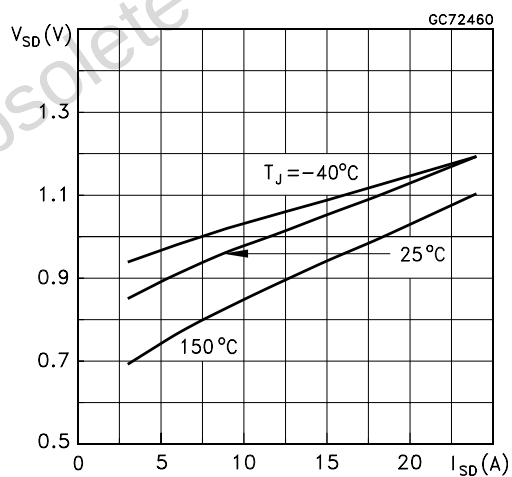


Fig. 1: Unclamped Inductive Load Test Circuit

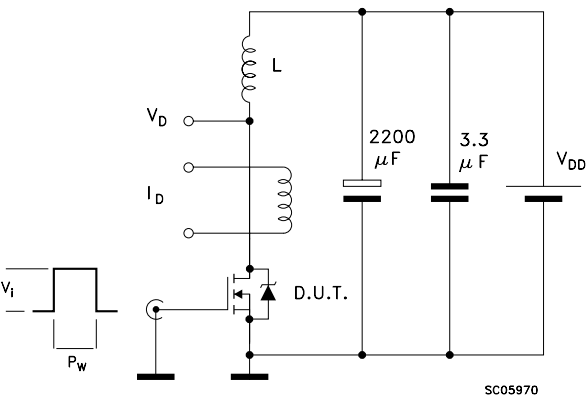


Fig. 2: Unclamped Inductive Waveform

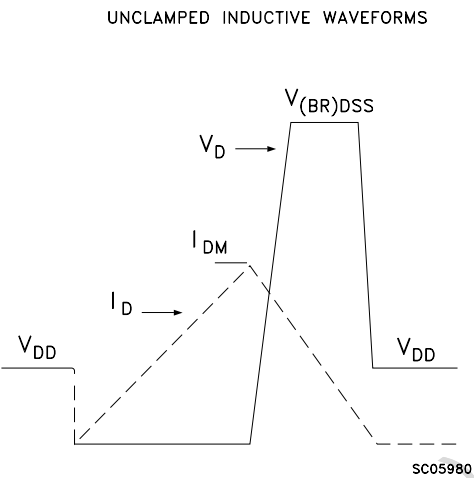


Fig. 3: Switching Times Test Circuits For Resistive Load

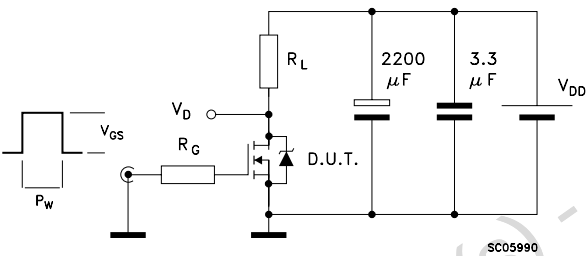


Fig. 4: Gate Charge test Circuit

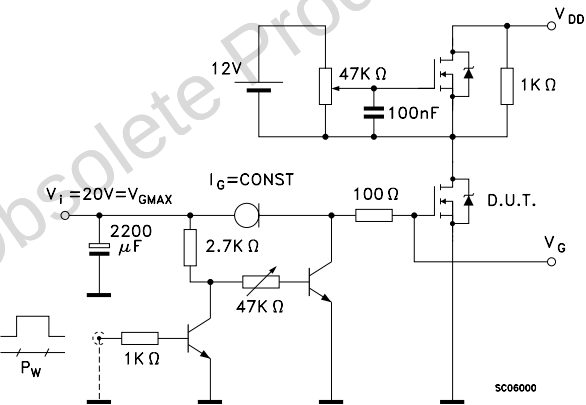
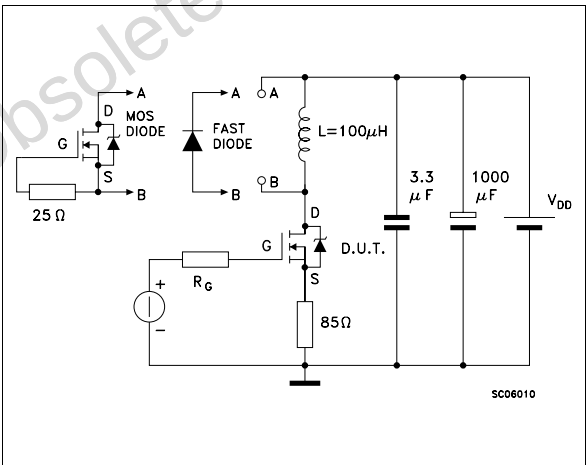
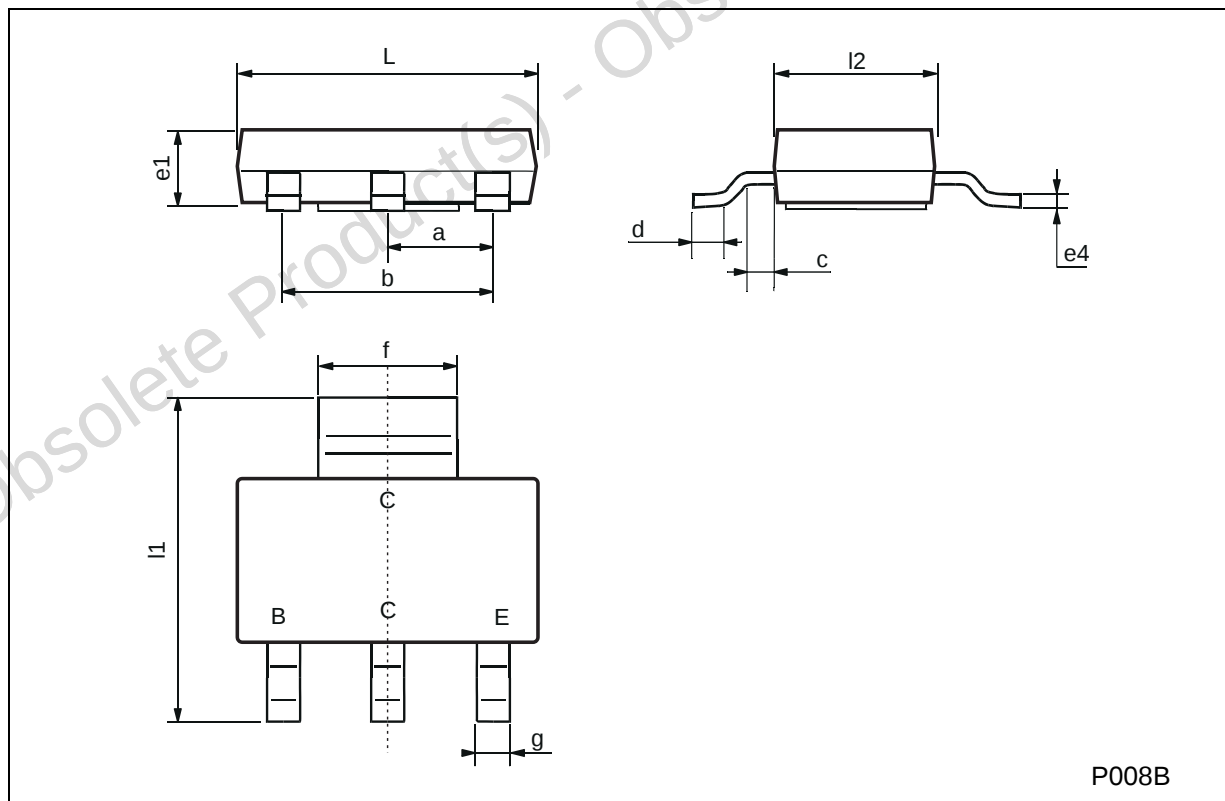


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



## SOT-223 MECHANICAL DATA

| DIM. | mm   |      |      | mils  |       |       |
|------|------|------|------|-------|-------|-------|
|      | MIN. | TYP. | MAX. | MIN.  | TYP.  | MAX.  |
| a    | 2.27 | 2.3  | 2.33 | 89.4  | 90.6  | 91.7  |
| b    | 4.57 | 4.6  | 4.63 | 179.9 | 181.1 | 182.3 |
| c    | 0.2  | 0.4  | 0.6  | 7.9   | 15.7  | 23.6  |
| d    | 0.63 | 0.65 | 0.67 | 24.8  | 25.6  | 26.4  |
| e1   | 1.5  | 1.6  | 1.7  | 59.1  | 63    | 66.9  |
| e4   |      |      | 0.32 |       |       | 12.6  |
| f    | 2.9  | 3    | 3.1  | 114.2 | 118.1 | 122.1 |
| g    | 0.67 | 0.7  | 0.73 | 26.4  | 27.6  | 28.7  |
| l1   | 6.7  | 7    | 7.3  | 263.8 | 275.6 | 287.4 |
| l2   | 3.5  | 3.5  | 3.7  | 137.8 | 137.8 | 145.7 |
| L    | 6.3  | 6.5  | 6.7  | 248   | 255.9 | 263.8 |



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