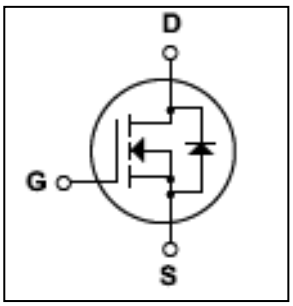
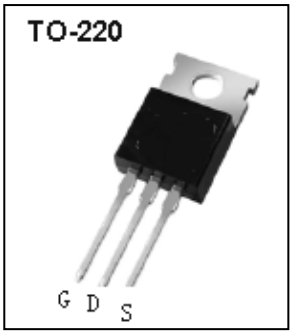
## Silicon N-Channel MOSFET

### Features

- 12A,650V,$R_{DS(on)}$(Max0.8Ω)@$V_{GS}$=10V
- Ultra-low Gate Charge(Typical 30nC)
- Fast Switching Capability
- 100% Avalanche Tested
- Maximum Junction Temperature Range(150℃)




### General Description

This Power MOSFET is produced using Winsemi's advanced planar stripe, VDMOS technology. This latest technology has been especially designed to minimize on-state resistance, have a high rugged avalanche characteristics. This devices is specially well suited for AC-DC switching power supplies, DC-DC power converters, high voltage H-bridge motor drive PMW

### Absolute Maximum Ratings

| Symbol | Parameter | | Value | Units |
|---|---|---|---|---|
| $V_{DSS}$ | Drain Source Voltage | | 650 | V |
| $I_D$ | Continuous Drain Current(@Tc=25℃) | | 12 | A |
| | Continuous Drain Current(@Tc=100℃) | | | A |
| $I_{DM}$ | Drain Current Pulsed | (Note1) | | A |
| $V_{GS}$ | Gate to Source Voltage | | ±30 | V |
| $E_{AS}$ | Single Pulsed Avalanche Energy | (Note 2) | 990 | mJ |
| $E_{AR}$ | Repetitive Avalanche Energy | (Note 1) | 22 | mJ |
| dv/dt | Peak Diode Recovery dv/dt | (Note 3) | 4.5 | V/ns |
| $P_D$ | Total Power Dissipation(@Tc=25℃) | | 178 | W |
| | Derating Factor above 25℃ | | 1.43 | W/℃ |
| $T_{J,}$ $T_{stg}$ | Junction and Storage Temperature | | -55~150 | ℃ |
| $T_L$ | Channel Temperature | | 300 | ℃ |

### Thermal Characteristics

| Symbol | Parameter | Value | | | Units |
|---|---|---|---|---|---|
| | | Min | Typ | Max | |
| $R_{QJC}$ | Thermal Resistance, Junction-to-Case | - | - | 0.70 | ℃/W |
| $R_{QCS}$ | Thermal Resistance, Case-to-Sink | - | - | - | ℃/W |
| $R_{QJA}$ | Thermal Resistance, Junction-to-Ambient | - | - | 62.5 | ℃/W |

## Electrical Characteristics (Tc = 25°C)

| Characteristics | | Symbol | Test Condition | Min | Type | Max | Unit |
|---|---|---|---|---|---|---|---|
| Gate leakage current | | $I_{GSS}$ | VGS = ±30 V, VDS = 0 V | - | - | ±100 | nA |
| Gate−source breakdown voltage | | $V_{(BR)GSS}$ | IG = ±10 μA, VDS = 0 V | ±30 | - | - | V |
| Drain cut−off current | | $I_{DSS}$ | VDS = 650 V, VGS = 0 V | - | - | 10 | μA |
| | | | VDS = 480 V, Tc = 125**°C** | - | - | 100 | μA |
| Drain−source breakdown voltage | | $V_{(BR)DSS}$ | ID = 250 μA, VGS = 0 V | 650 | - | - | V |
| Gate threshold voltage | | $V_{GS(th)}$ | VDS = 10 V, ID =250 μA | 2 | - | 4 | V |
| Drain−source ON resistance | | $R_{DS(ON)}$ | VGS = 10 V, ID = 6A | - | 0.64 | 0.8 | Ω |
| Forward Transconductance | | gfs | VDS = 50 V, ID =6A | - | 6.4 | - | S |
| Input capacitance | | $C_{iss}$ | VDS = 25 V, | - | 1830 | - | pF |
| Reverse transfer capacitance | | $C_{rss}$ | VGS = 0 **V**, | - | 155 | - | |
| Output capacitance | | $C_{oss}$ | f = 1 MHz | - | 2.0 | - | |
| Switching time | Rise time | tr | VDD =325V, | - | 50 | - | ns |
| | Turn−on time | ton | ID = 12A | - | 49 | - | |
| | Fall time | tf | RG=25 Ω | - | 310 | - | |
| | Turn−off time | toff | (Note4,5) | - | 54 | - | |
| Total gate charge (gate−source plus gate−drain) | | Qg | VDD =520 V, | - | 51.7 | - | nC |
| Gate−source charge | | Qgs | VGS = 10 V, ID = 12A | - | 9.6 | - | |
| Gate−drain (“miller”) Charge | | Qgd | (Note4,5) | - | 18.6 | - | |

### Source−Drain Ratings and Characteristics (Ta = 25°C)

| Characteristics | Symbol | Test Condition | Min | Type | Max | Unit |
|---|---|---|---|---|---|---|
| Continuous drain reverse current | $I_{DR}$ | - | - | - | 12 | A |
| Pulse drain reverse current | $I_{DRP}$ | - | - | - | 48 | A |
| Forward voltage (diode) | $V_{DSF}$ | IDR = 10A, VGS = 0 V | - | - | 1.4 | V |
| Reverse recovery time | trr | IDR = 10 A, VGS = 0 V, | - | 450 | - | ns |
| Reverse recovery charge | Qrr | dIDR / dt = 100 A / μs | - | 5.0 | - | μC |

Note 1.Repeativity rating :pulse width limited by junction temperature
2.L=14mH,$I_{AS}$=12A,$V_{DD}$=95V,$R_G$=25Ω,Starting $T_J$=25℃
3.$I_{SD}$≤10A,di/dt≤200A/us, $V_{DD}$<$BV_{DSS}$,STARTING TJ=25℃
4.Pulse Test: Pulse Width≤300us,Duty Cycle≤2%
5.Essentially independent of operating temperature.

This transistor is an electrostatic sensitive device

Please handle with caution

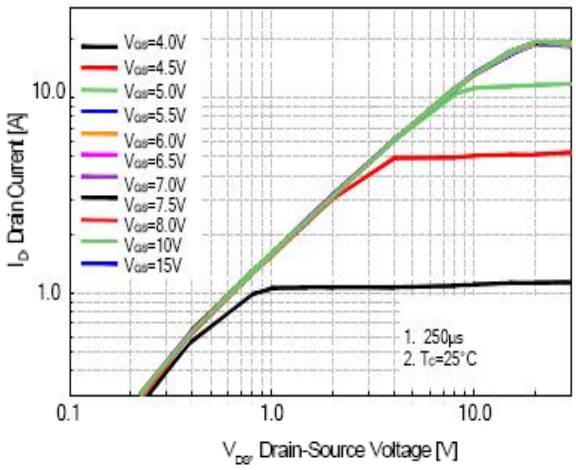



**Fig. 1 On-State Characteristics**

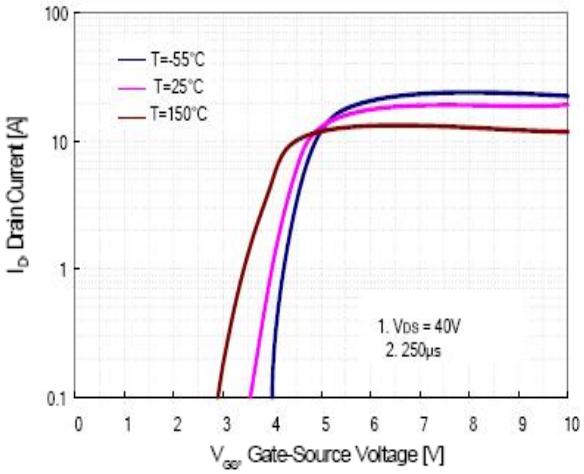



**Fig.2 Transfer Current Characteristics**

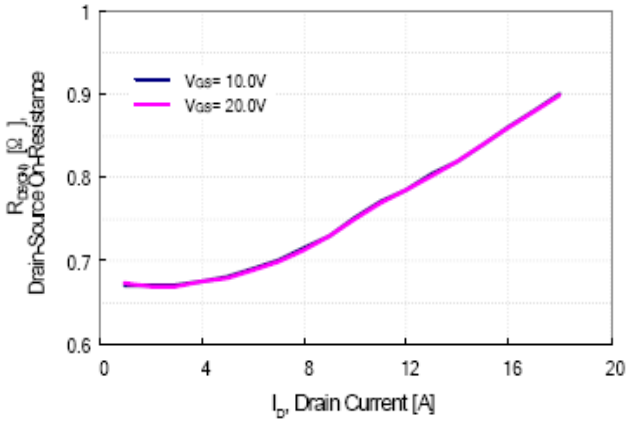



**Fig.3 On-Resistance Variation vs Drain Current**

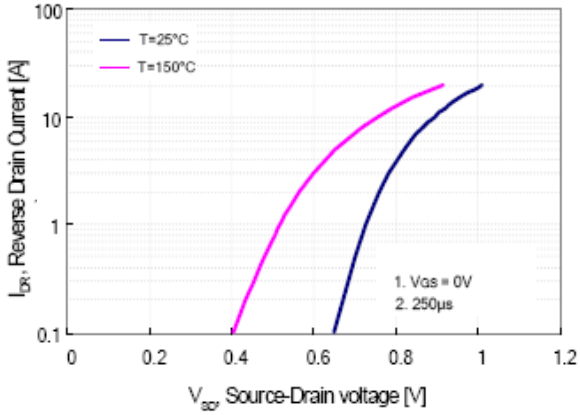



**Fig.4 Body Diode Forward Voltage Variation with Source Current And Temperature**

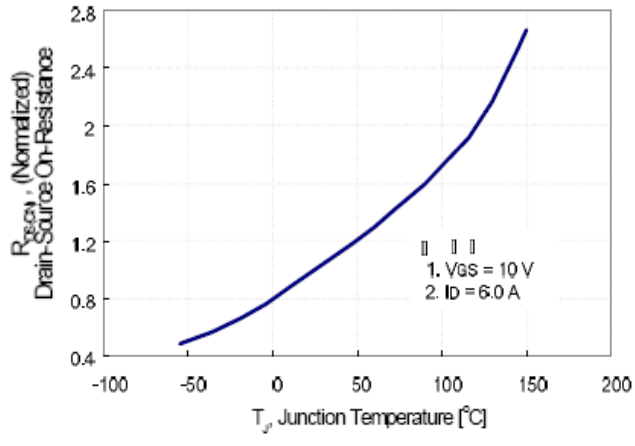



**Fig.5 On-Resistance Variation vs Junction Temperature**

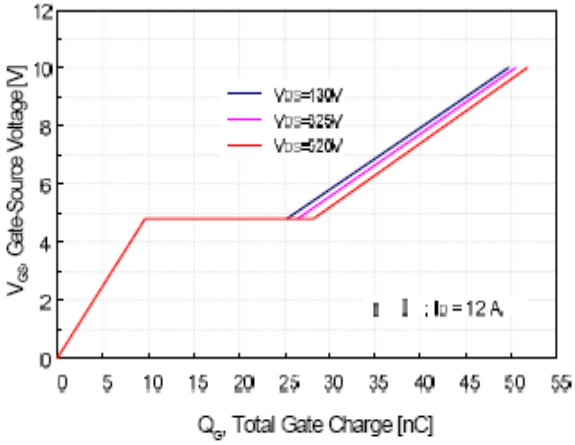



**Fig.6 Gate Charge Characteristics**

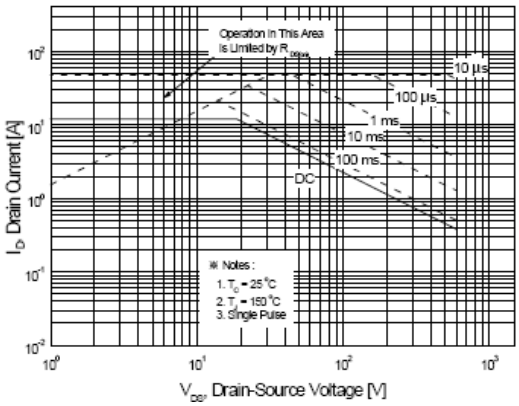



**Fig.7 Maximum Safe Operation Area**

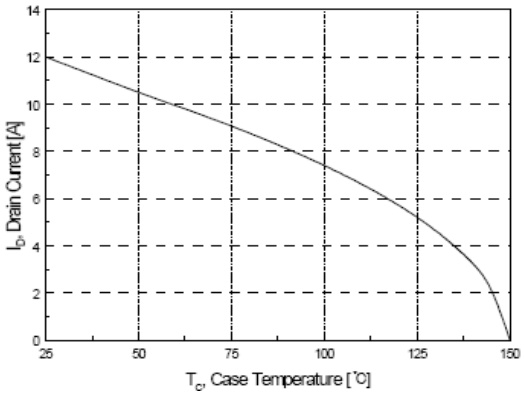



**Fig.8 Maximum Drain Current vs Case Temperature**

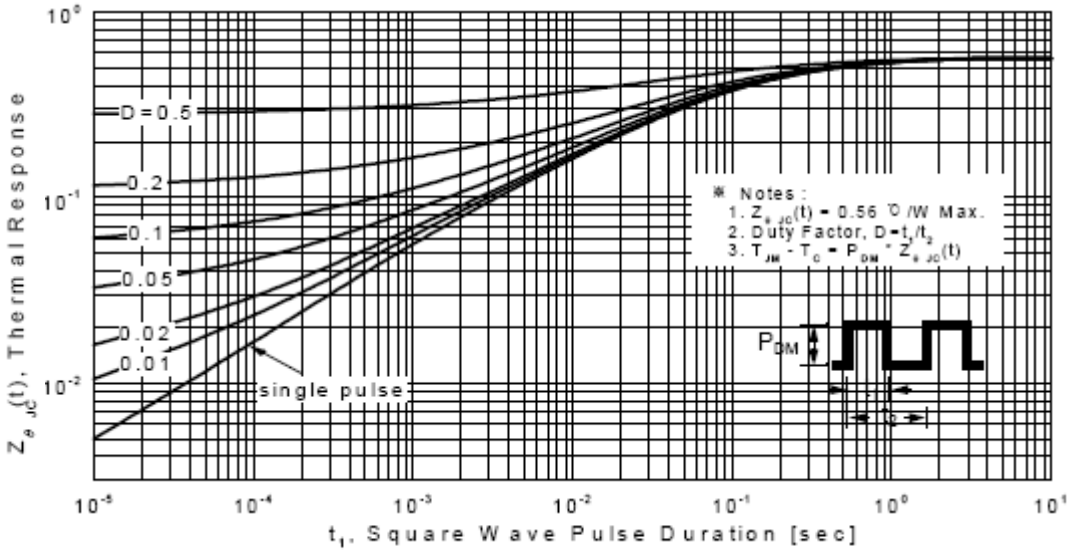



**Fig.9 Transient Thermal Response Curve**

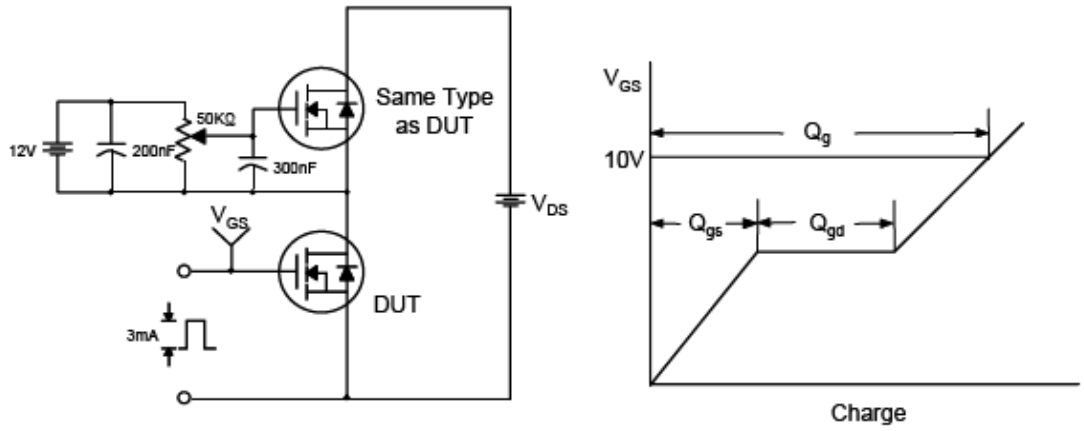



Fig.10 Gate Test Circuit & Waveform

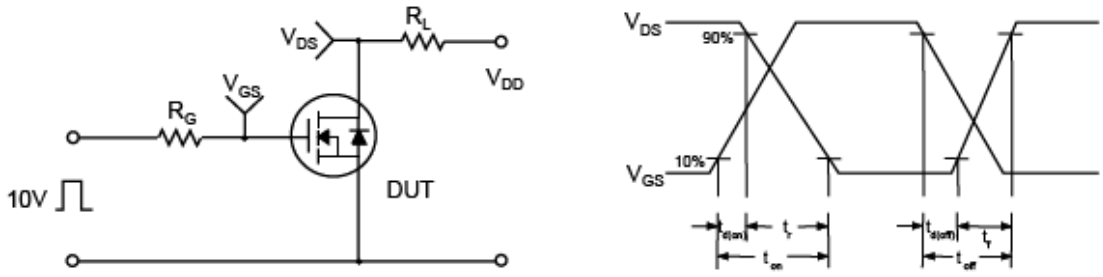



Fig.11 Resistive Switching Test Circuit & Waveform

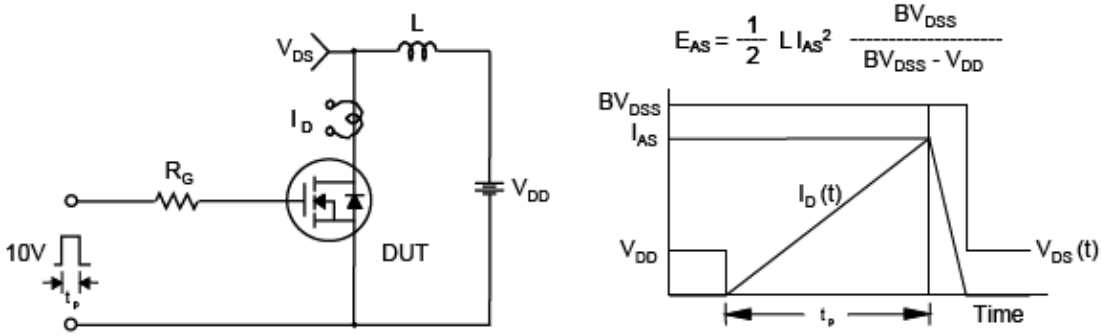



Fig.12 Unclamped Inductive Switching Test Circuit & Waveform

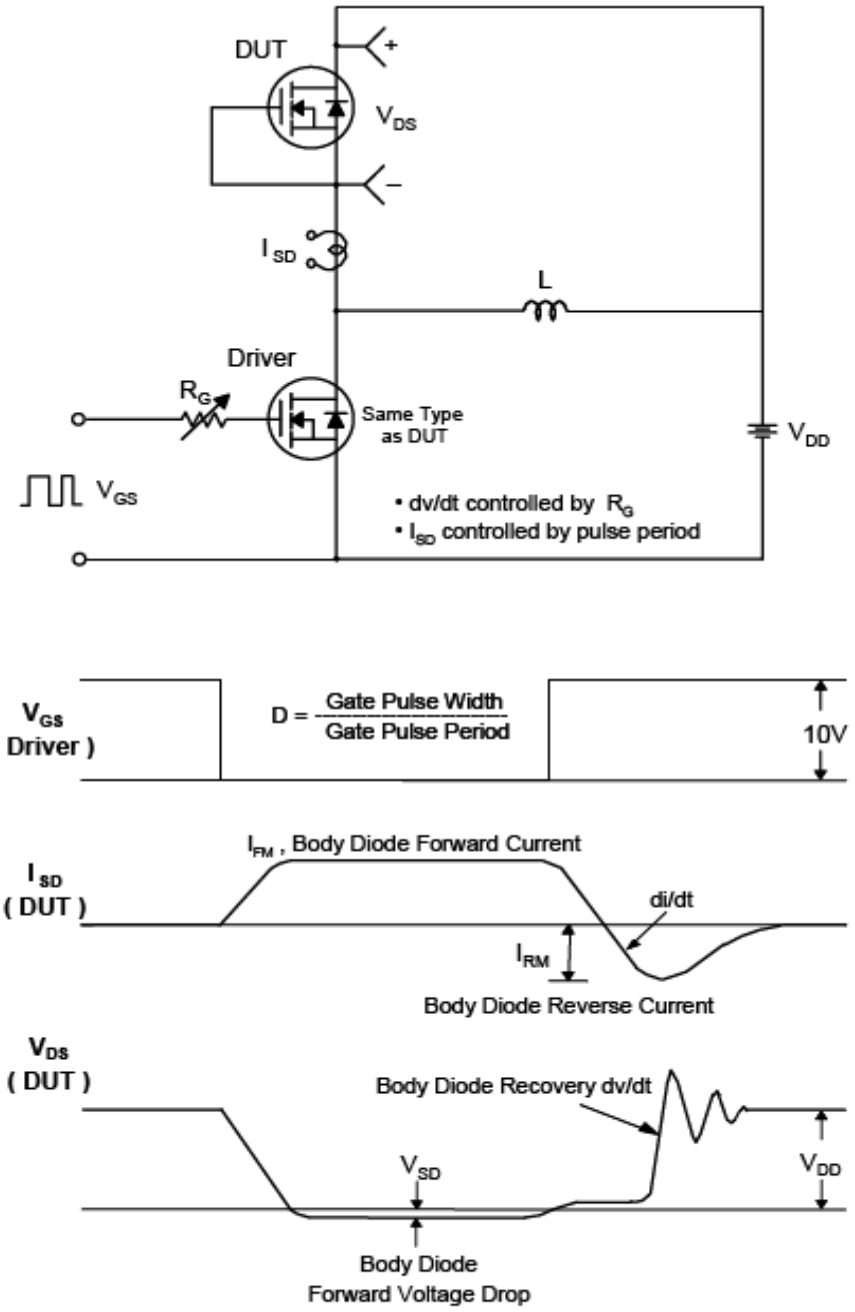
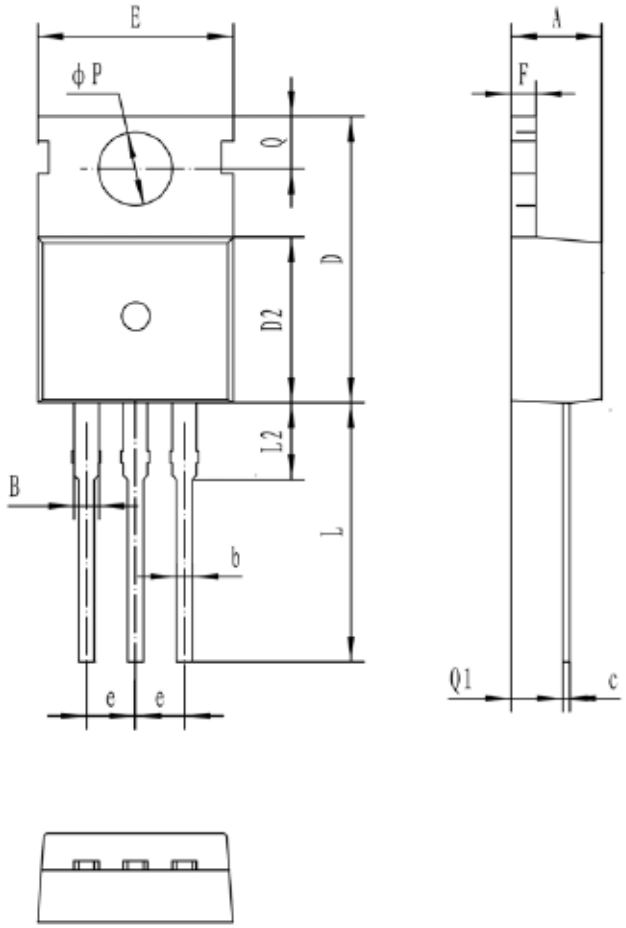



Fig.13 Peak Diode Recovery dv/dt Test Circuit & Waveform

## TO-220C Package Dimension

Unit: mm






| symbol | MIN | MAX |
|---|---|---|
| A | 4.30 | 4.70 |
| B | 1.10 | 1.40 |
| b | 0.70 | 0.95 |
| c | 0.40 | 0.65 |
| D | 15.20 | 16.20 |
| D2 | 9.00 | 9.40 |
| E | 9.70 | 10.10 |
| e | 2.39 | 2.69 |
| F | 1.25 | 1.40 |
| L | 12.60 | 13.60 |
| L2 | 2.80 | 3.20 |
| Q | 2.60 | 3.00 |
| Q1 | 2.20 | 2.60 |
| P | 3.50 | 3.80 |