

### • General Description

It combines trench MOSFET technology with a low resistance package to provide extremely low  $R_{DS(ON)}$ .

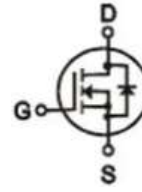
### • Features

- Advance high cell density Trench technology
- Low  $R_{DS(ON)}$  to minimize conductive loss
- Low Gate Charge for fast switching
- Low Thermal resistance

### • Application

- MB/VGA Vcore
- SMPS 2<sup>nd</sup> Synchronous Rectifier
- POL application
- BLDC Motor driver

### • Product Summary



$$V_{DS}=40V$$

$$R_{DS(ON)}=2.5m\Omega$$

$$I_D=100A$$



TO-251



### • Ordering Information:

|                           |            |
|---------------------------|------------|
| Part NO.                  | ZM025N04HI |
| Marking                   | ZM025N04H  |
| Packing Information       | TUBE       |
| Basic ordering unit (pcs) | 3600       |

### • Absolute Maximum Ratings ( $T_c=25^\circ C$ )

| Parameter                                                                                | Symbol                 | Rating     | Unit       |
|------------------------------------------------------------------------------------------|------------------------|------------|------------|
| Drain-Source Voltage                                                                     | $V_{DS}$               | 40         | V          |
| Gate-Source Voltage                                                                      | $V_{GS}$               | $\pm 20$   | V          |
| Continuous Drain Current                                                                 | $I_{D@TC=25^\circ C}$  | 100        | A          |
|                                                                                          | $I_{D@TC=75^\circ C}$  | 76         | A          |
|                                                                                          | $I_{D@TC=100^\circ C}$ | 63         | A          |
| Pulsed Drain Current ①                                                                   | $I_{DM}$               | 300        | A          |
| Total Power Dissipation                                                                  | $P_{D@TC=25^\circ C}$  | 80         | W          |
| Total Power Dissipation                                                                  | $P_{D@TA=25^\circ C}$  | 2.4        | W          |
| Operating Junction Temperature                                                           | $T_J$                  | -55 to 150 | $^\circ C$ |
| Storage Temperature                                                                      | $T_{STG}$              | -55 to 150 | $^\circ C$ |
| Single Pulse Avalanche Energy<br>( $L=0.5mH, V_{GS}=10V, R_g=25\Omega, T_J=25^\circ C$ ) | $E_{AS}$               | 860        | mJ         |
| Single Pulse Avalanche Energy<br>( $L=0.1mH, V_{GS}=10V, R_g=25\Omega, T_J=25^\circ C$ ) | $E_{AS}$               | 350        | mJ         |

**•Thermal resistance**

| Parameter                                     | Symbol     | Min. | Typ. | Max. | Unit          |
|-----------------------------------------------|------------|------|------|------|---------------|
| Thermal resistance, junction - case           | $R_{thJC}$ | -    | -    | 1.55 | $^{\circ}C/W$ |
| Thermal resistance, junction - ambient        | $R_{thJA}$ | -    | -    | 52   | $^{\circ}C/W$ |
| Soldering temperature, wave soldering for 10s | $T_{sold}$ | -    | -    | 265  | $^{\circ}C$   |

**•Electronic Characteristics**

| Parameter                         | Symbol       | Condition                     | Min. | Typ | Max.      | Unit       |
|-----------------------------------|--------------|-------------------------------|------|-----|-----------|------------|
| Drain-Source Breakdown Voltage    | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$     | 40   |     |           | V          |
| Gate Threshold Voltage            | $V_{GS(TH)}$ | $V_{GS}=V_{DS}, I_D=250\mu A$ | 2.0  |     | 4.0       | V          |
| Drain-Source Leakage Current      | $I_{DSS}$    | $V_{DS}=40V, V_{GS}=0V$       |      |     | 1.0       | $\mu A$    |
| Gate- Source Leakage Current      | $I_{GSS}$    | $V_{GS}=\pm 20V, V_{DS}=0V$   |      |     | $\pm 100$ | nA         |
| Static Drain-source On Resistance | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=24A$         |      | 2.5 | 3.2       | m $\Omega$ |
| Forward Trans conductance         | $g_{FS}$     | $V_{DS}=10V, I_D=10A$         |      | 32  |           | S          |
| Source-drain voltage              | $V_{SD}$     | $I_S=24A$                     |      |     | 1.28      | V          |

**•Electronic Characteristics**

| Parameter                    | Symbol    | Condition                | Min. | Typ  | Max. | Unit |
|------------------------------|-----------|--------------------------|------|------|------|------|
| Input capacitance            | $C_{iss}$ | $f=1MHz$<br>$V_{DS}=25V$ | -    | 9300 | -    | pF   |
| Output capacitance           | $C_{oss}$ |                          | -    | 760  | -    |      |
| Reverse transfer capacitance | $C_{rss}$ |                          | -    | 550  | -    |      |

**•Gate Charge characteristics**

| Parameter            | Symbol       | Condition                                                 | Min. | Typ | Max. | Unit     |
|----------------------|--------------|-----------------------------------------------------------|------|-----|------|----------|
| Gate Resistance      | $R_g$        | $f=1MHz$                                                  |      | 2.5 |      | $\Omega$ |
| Total gate charge    | $Q_g$        | $V_{DD}=25V$<br>$I_D=8A$<br>$V_{GS}=10V$                  | -    | 130 | -    | nC       |
| Gate - Source charge | $Q_{gs}$     |                                                           | -    | 19  | -    |          |
| Gate - Drain charge  | $Q_{gd}$     |                                                           | -    | 34  | -    |          |
| Turn-ON Delay time   | $t_{D(on)}$  | $V_{GS}=10V, V_{DS}=15V$<br>$R_G=3.3\Omega,$<br>$I_D=25A$ |      | 14  |      | ns       |
| Turn-ON Rise time    | $t_r$        |                                                           |      | 15  |      | ns       |
| Turn-Off Delay time  | $t_{D(off)}$ |                                                           |      | 91  |      | ns       |

|                         |          |                                                                                |  |    |  |    |
|-------------------------|----------|--------------------------------------------------------------------------------|--|----|--|----|
| Turn-Off Fall time      | $t_f$    | $V_{DD} = 20\text{ V},$<br>$dI_S/dt = 100\text{ A/us},$<br>$I_S = 30\text{ A}$ |  | 34 |  | ns |
| Reverse Recovery Time   | $t_{RR}$ |                                                                                |  | 25 |  | ns |
| Charge Time             | $t_a$    |                                                                                |  | 14 |  | ns |
| Discharge Time          | $t_b$    |                                                                                |  | 11 |  | ns |
| Reverse Recovery Charge | $Q_{RR}$ |                                                                                |  | 16 |  | ns |

Note: ① Pulse Test : Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$  ;

Fig.1 Power Dissipation

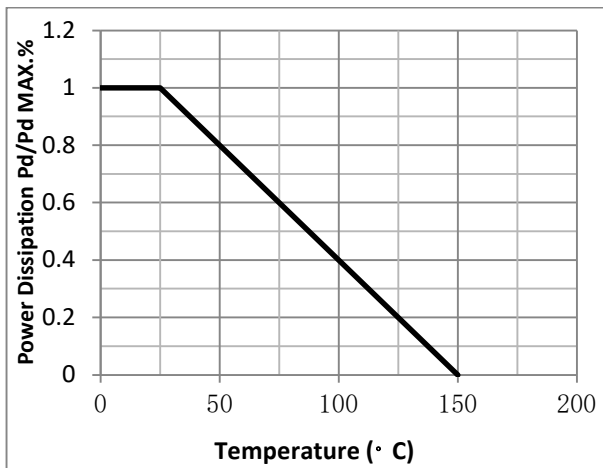


Fig.2 Typical output Characteristics

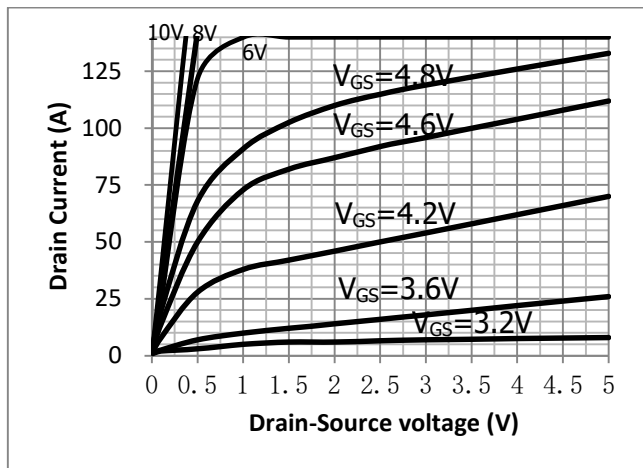


Fig.3 Threshold Voltage V.S Junction Temperature

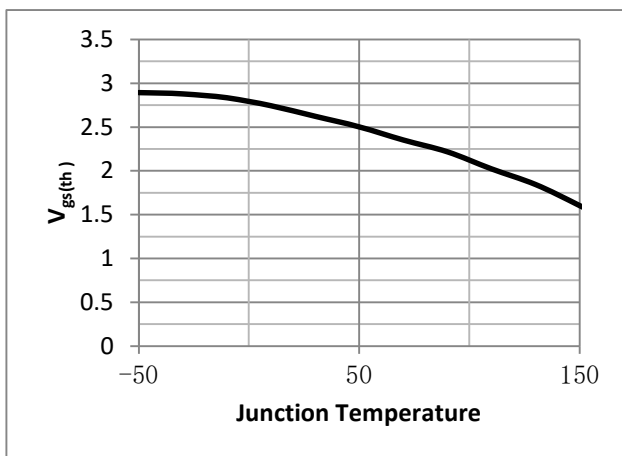


Fig.4 Resistance V.S Drain Current

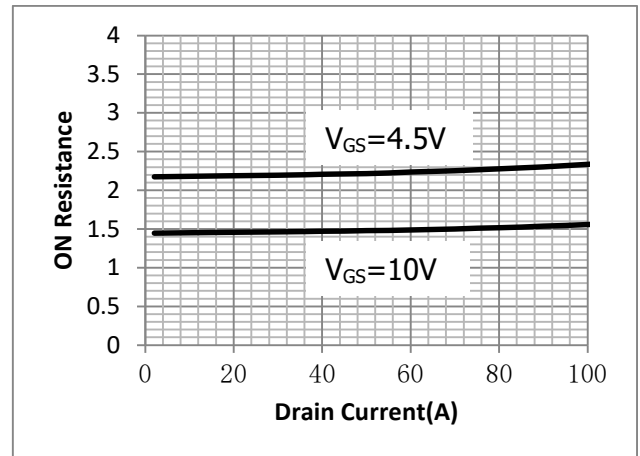


Fig.5 On-Resistance VS Gate Source Voltage

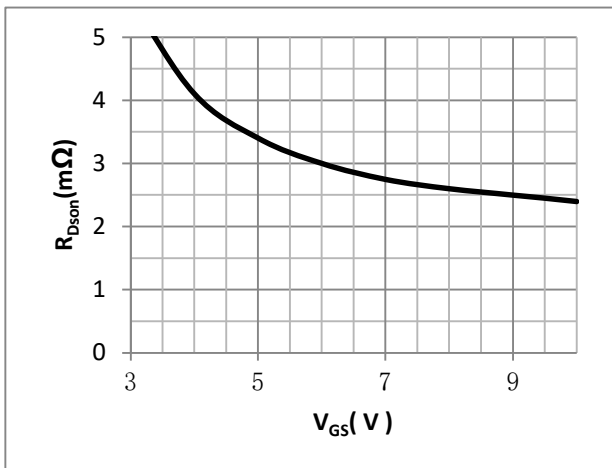


Fig.6 On-Resistance V.S Junction Temperature

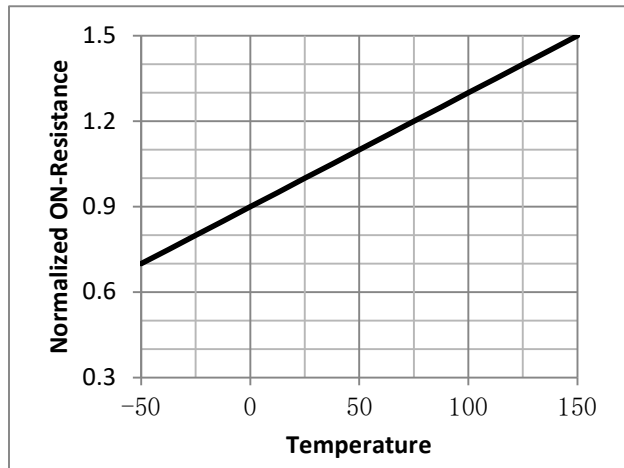


Fig.7 Gate Charge Characteristics

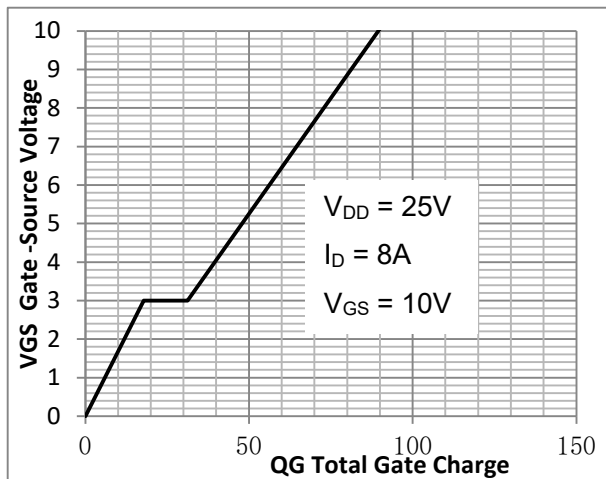


Fig.8 Capacitance vs  $V_{DS}$

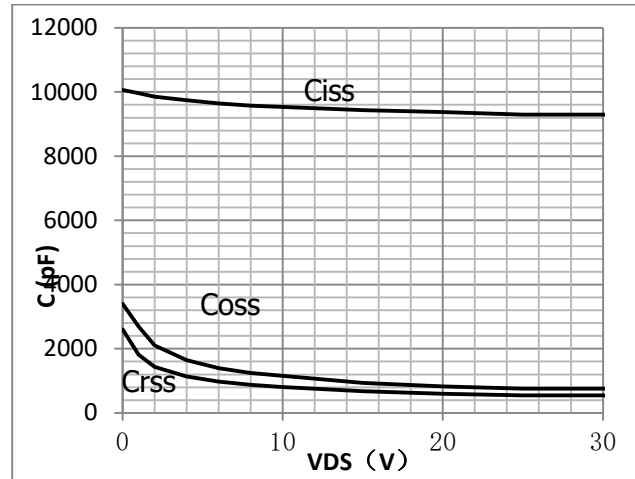


Fig.9 SOA Maximum Safe Operating Area

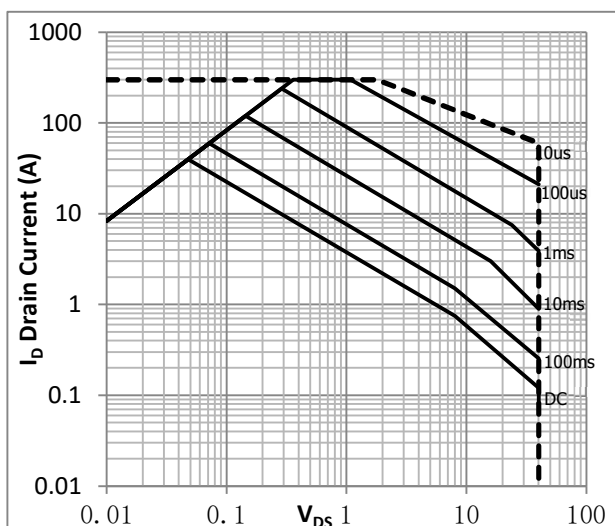


Fig.10  $I_D$ -Junction Temperature

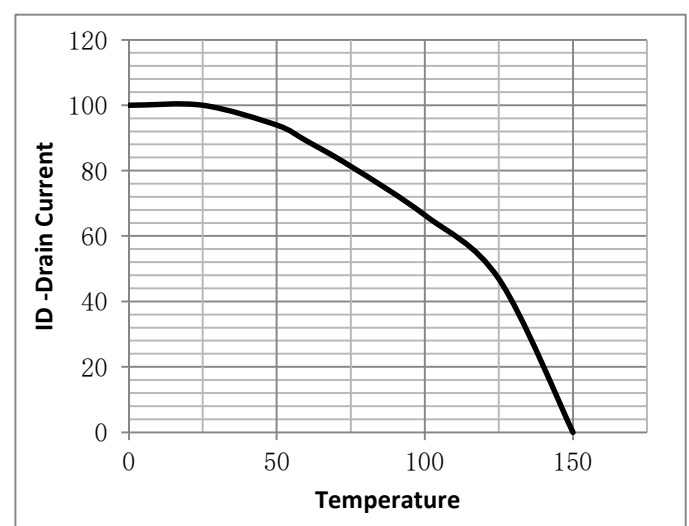


Figure 11. Diode Forward Voltage vs. Current

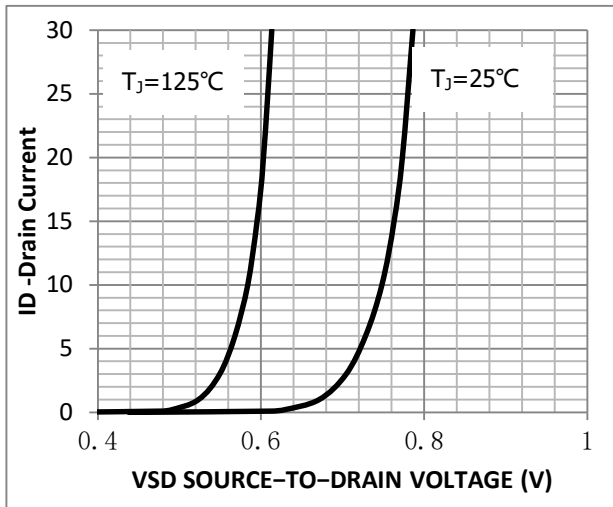


Figure 12. Transfer Characteristics

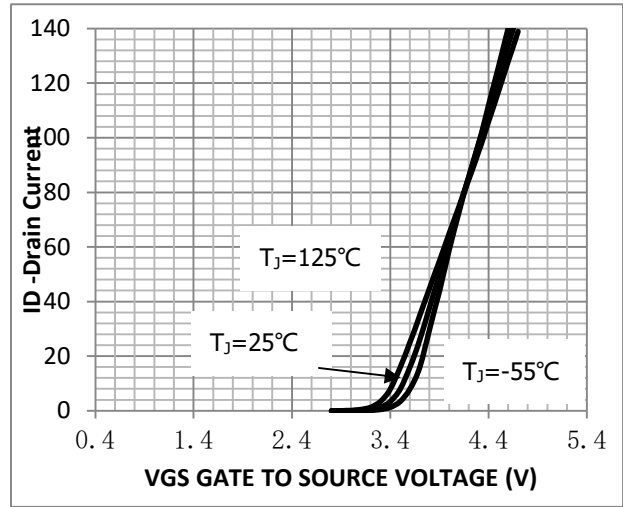


Fig.13 Gate Charge Measurement Circuit

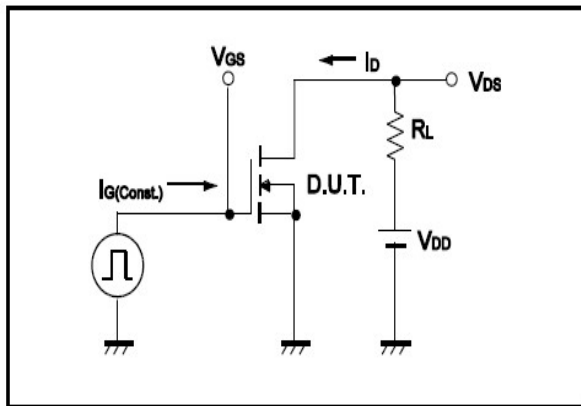


Fig.14 Gate Charge Waveform

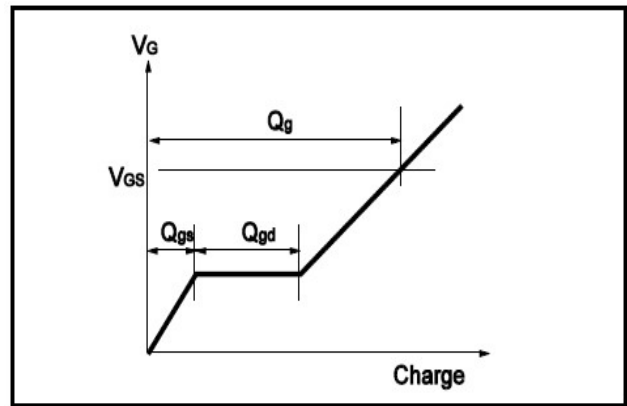


Fig.15 Switching Time Measurement Circuit

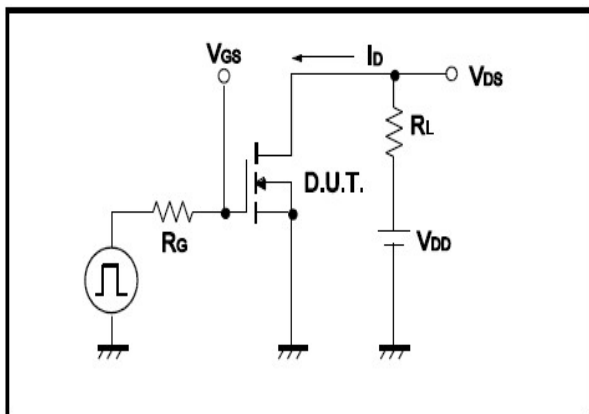


Fig.16 Switching Time Waveform

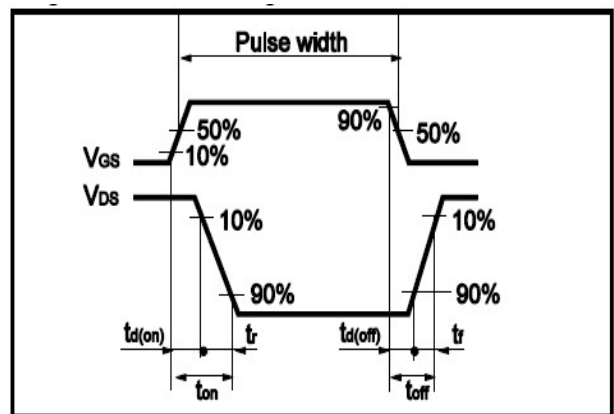


Fig.17 Avalanche Measurement Circuit

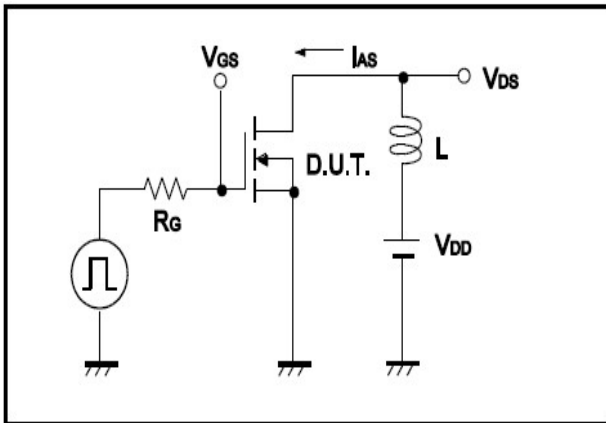
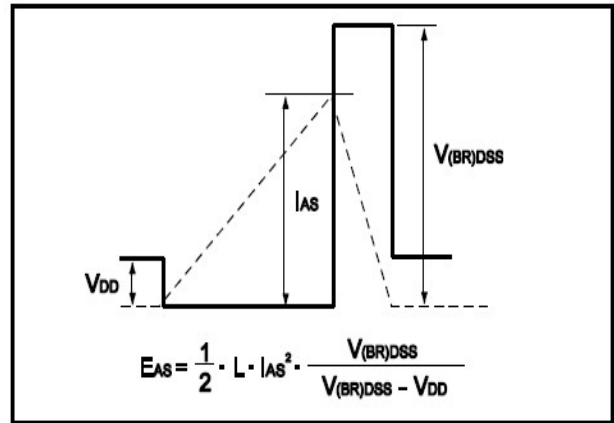


Fig.18 Avalanche Waveform



**•Dimensions(TO-251)**

Unit: mm

| SYMBOL | min  | max  | SYMBOL | min  | max  |
|--------|------|------|--------|------|------|
| A      | 2.10 | 2.50 | D      | 6.35 | 6.80 |
| A1     | 0.95 | 1.30 | D1     | 5.10 | 5.50 |
| B      | 0.80 | 1.25 | E      | 5.30 | 6.30 |
| b      | 0.50 | 0.80 | e      | 2.24 | 2.35 |
| b1     | 0.70 | 0.90 | E1     | 4.43 | 4.73 |
| c      | 0.45 | 0.60 | L      | 7.00 | 9.40 |
| c1     | 0.45 | 0.60 |        |      |      |

