## ● General Description

The ZM016N04HN combines advanced 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

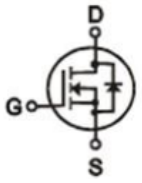
■Low Thermal resistance

## ●Application

■ Synchronous Rectification for AC-DC/DC-DC converter

■ BLDC Motor driver

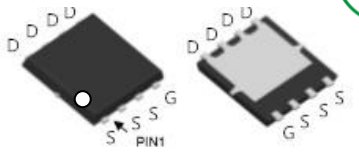
## ● Product Summary




$V_{DS}$=40V

$R_{DS(ON)}$ =1.55mΩ

$I_D$=220A




DFN5 x 6

## ●Ordering Information:

| | |
|---|---|
| Part NO. | ZM016N04HNC |
| Marking | ZM016N04H |
| Packing Information | REEL TAPE |
| Basic ordering unit (pcs) | 3000 |

## ●Absolute Maximum Ratings ($T_C$ =25℃)

| **Parameter** | **Symbol** | Rating | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 40 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Continuous Drain Current | $I_{D@}T_C$=25℃ | 220 | A |
| | $I_{D@}T_C$=75℃ | 165 | A |
| | $I_{D@}T_C$=100℃ | 138 | A |
| Pulsed Drain Current ① | $I_{DM}$ | 660 | A |
| Total Power Dissipation | $P_D@T_C$=25℃ | 85 | W |
| Total Power Dissipation | $P_D@T_A$=25℃ | 3.4 | W |
| Operating Junction Temperature | $T_J$ | -55 to 150 | ℃ |
| Storage Temperature | $T_{STG}$ | -55 to 150 | ℃ |
| Single Pulse Avalanche Energy@L=0.5mH | $E_{AS}$ | 1150 | mJ |

| | | | |
|---|---|---|---|
| Single Pulse Avalanche Energy@L=0.1mH | $E_{AS}$ | 460 | mJ |

## ●Thermal resistance

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Thermal resistance, junction - case | $R_{thJC}$ | - | - | 1.5 | °C/W |
| Thermal resistance, junction - ambient | $R_{thJA}$ | - | - | 37 | °C/W |
| Soldering temperature, wave soldering for 10s | $T_{sold}$ | - | - | 265 | °C |

## ●Electronic Characteristics

| Parameter | Symbol | Condition | Min. | Typ | Max. | Unit |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$ =0V, $I_D$ =250uA | 40 | | | V |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS}$ =$V_{DS}$, $I_D$ =250uA | 2.0 | | 4.0 | V |
| Drain-Source Leakage Current | $I_{DSS}$ | $V_{DS}$=40V, $V_{GS}$ =0V | | | 1.0 | uA |
| Gate- Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V, $V_{DS}$ =0V | | | ±100 | nA |
| Static Drain-source On Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=40A | | 1.55 | 2.1 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$ =25V, $I_D$=10A | | 25 | | s |
| Source-drain voltage | $V_{SD}$ | Is=40A | | | 1.28 | V |

## ●Electronic Characteristics

| Parameter | Symbol | Condition | Min. | Typ | Max. | Unit |
|---|---|---|---|---|---|---|
| Input capacitance | $C_{iss}$ | $V_{GS}$=0V, $V_{DS}$=20V<br>f = 1MHz | - | 6610 | - | pF |
| Output capacitance | $C_{oss}$ | | - | 460 | - | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 210 | - | |

## ●Gate Charge characteristics($T_a$ = 25℃)

| Parameter | Symbol | Condition | Min. | Typ | Max. | Unit |
|---|---|---|---|---|---|---|
| Gate Risistance | Rg | f = 1MHz | | 2.5 | | Ω |
| Total gate charge | Qg | $V_{DD}$ = 20V<br>$I_D$ = 25A<br>$V_{GS}$ = 10V | - | 109 | - | nC |
| Gate - Source charge | Qgs | | - | 18 | - | |
| Gate - Drain charge | Qgd | | - | 21 | - | |
| Turn-ON Delay time | $t_{D(on)}$ | $V_{GS}$=10V, $V_{DS}$=15V | | 12 | | ns |

| | | | | | | |
|---|---|---|---|---|---|---|
| Turn-ON Rise time | $t_r$ | $R_G$ =3.3Ω, $I_D$ =25A | | 14 | | ns |
| Turn-Off Delay time | $t_{D(off)}$ | | | 89 | | ns |
| Turn-Off Fall time | $t_f$ | | | 34 | | ns |
| Reverse Recovery Time | $t_{RR}$ | VDD = 20 V, dIS/dt = 100 A/s, IS = 30 A | | 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 ≤ 300μs, Duty cycle ≤ 2% ;

Fig.1 Gate-Charge Characteristics

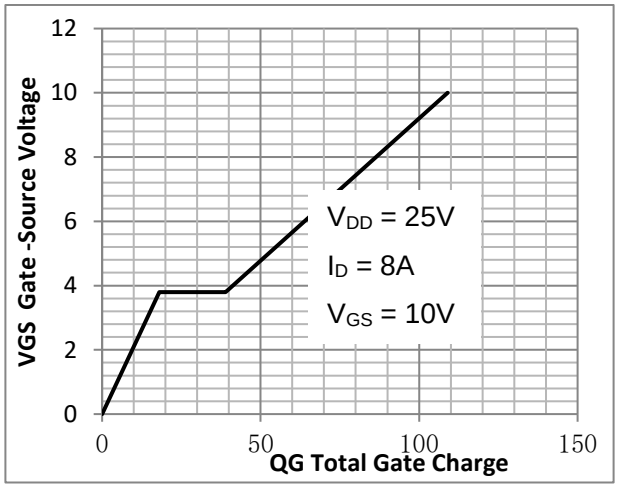



Fig.2 Capacitance Characteristics

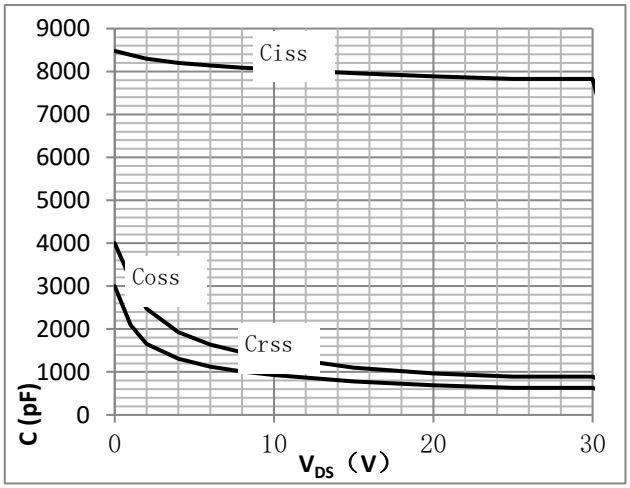



Fig.3 Power Dissipation

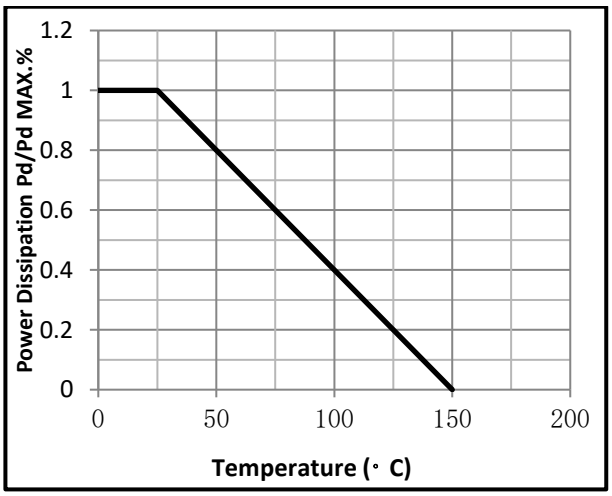



Fig.4 Typical output Characteristics

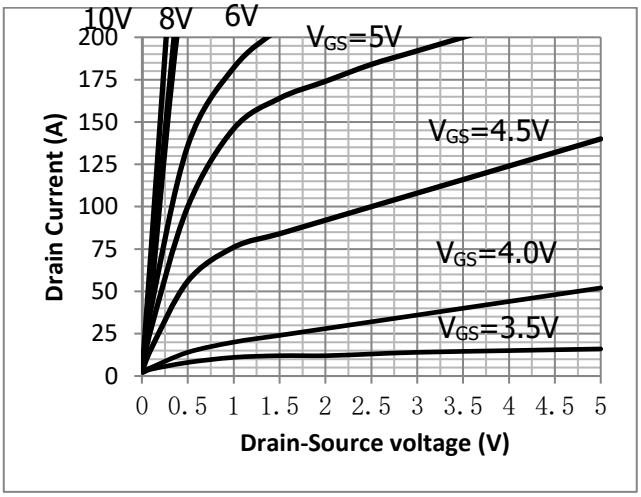


Fig.5 Threshold Voltage V.S Junction Temperature

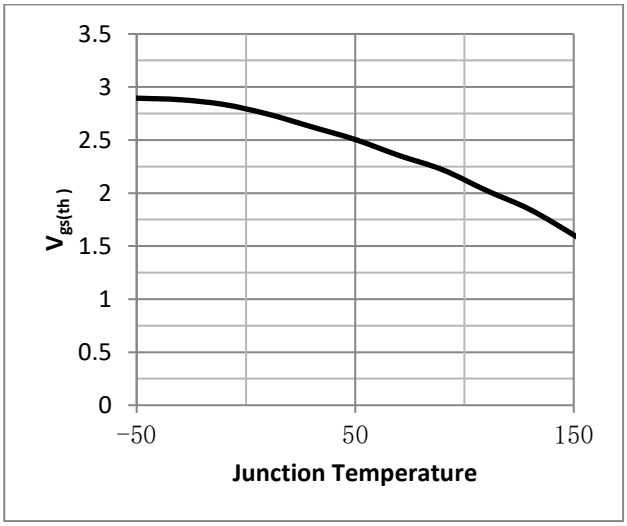



Fig.6 Resistance V.S Drain Current

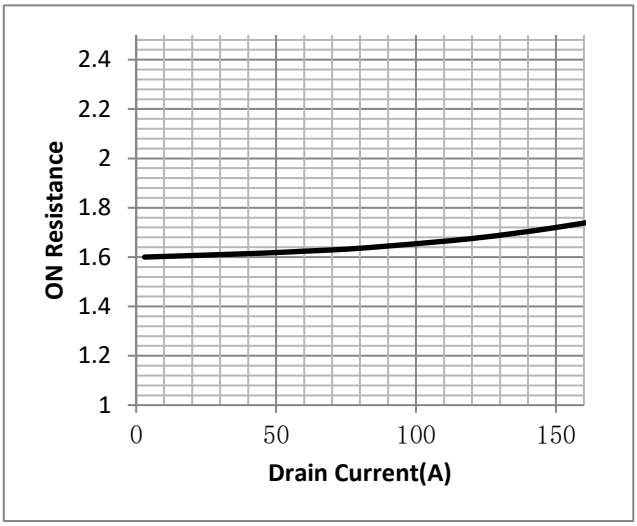



Fig.7 On-Resistance VS Gate Source Voltage

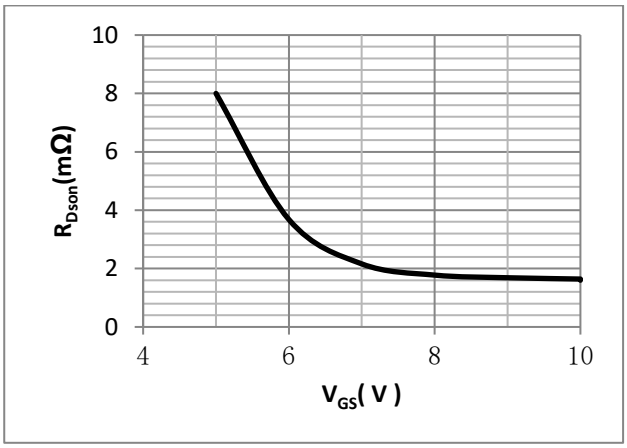



Fig.8 On-Resistance V.S Junction Temperature

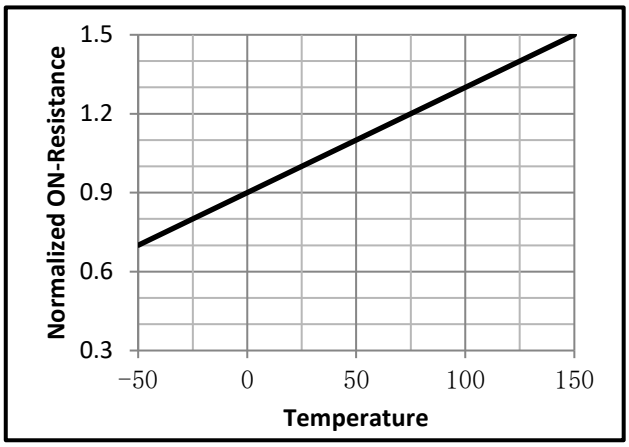



Figure 9. Diode Forward Voltage vs. Current

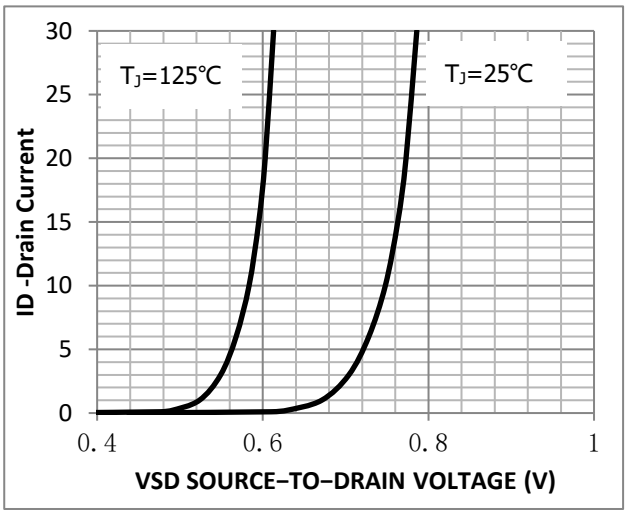



Figure 10. Transfer Characteristics

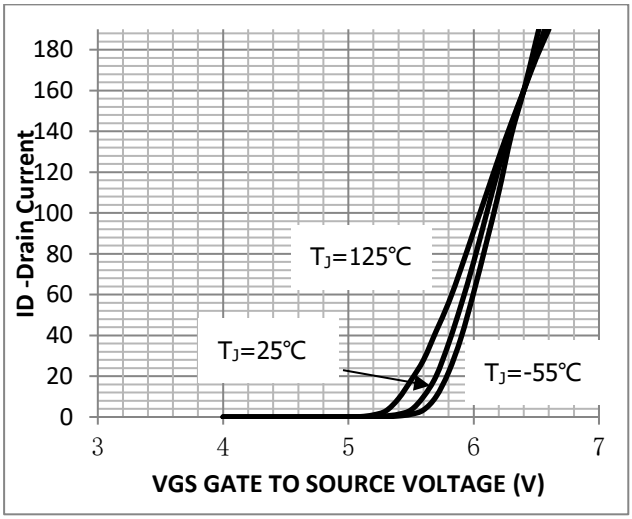


Fig.11 SOA Maximum Safe Operating Area

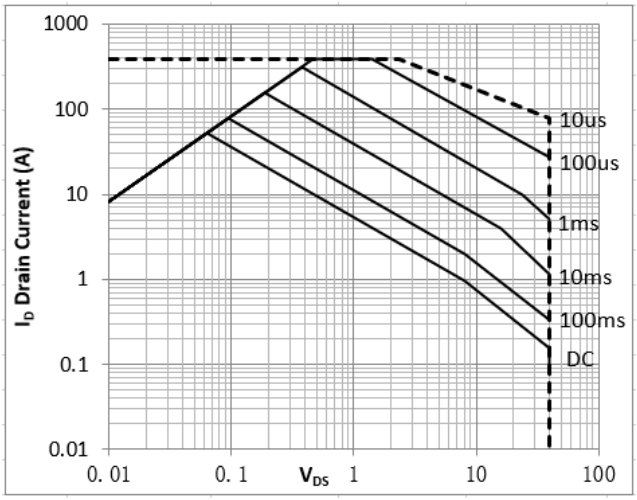



Fig.12 ID-Junction V.S Temperature

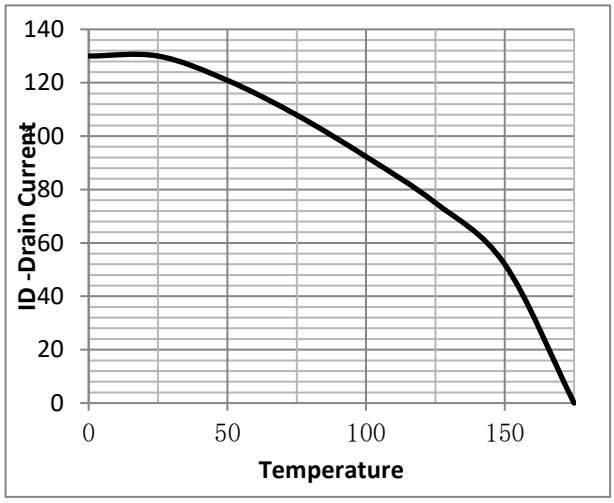



Fig.12 Switching Time Measurement Circuit

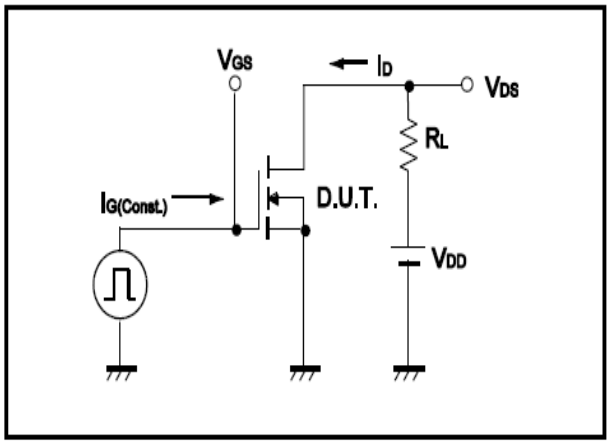



Fig.14 Gate Charge Waveform

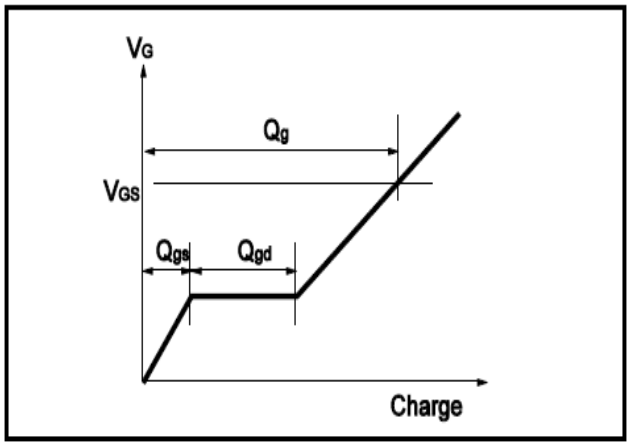



Fig.15Switching Time Measurement Circuit

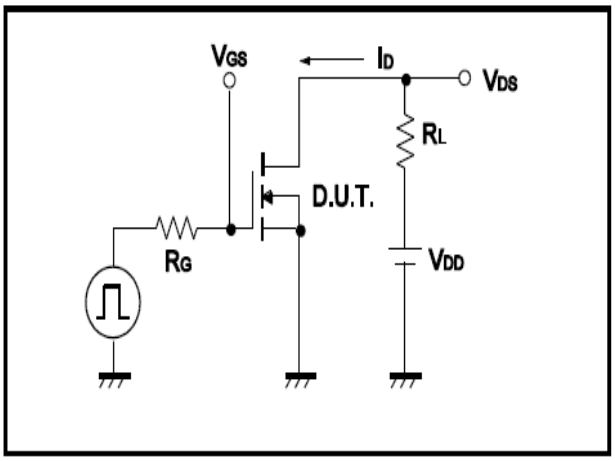
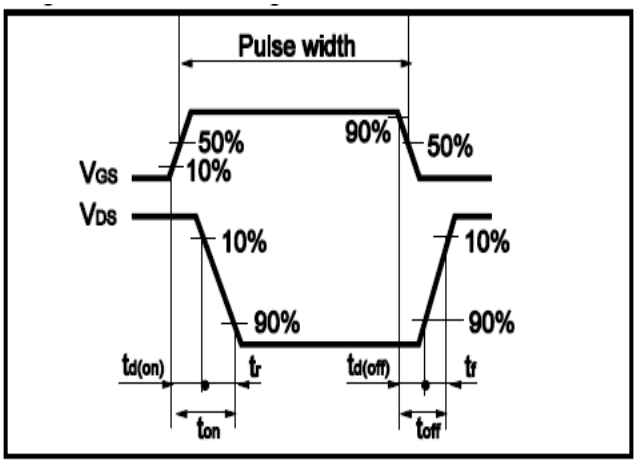
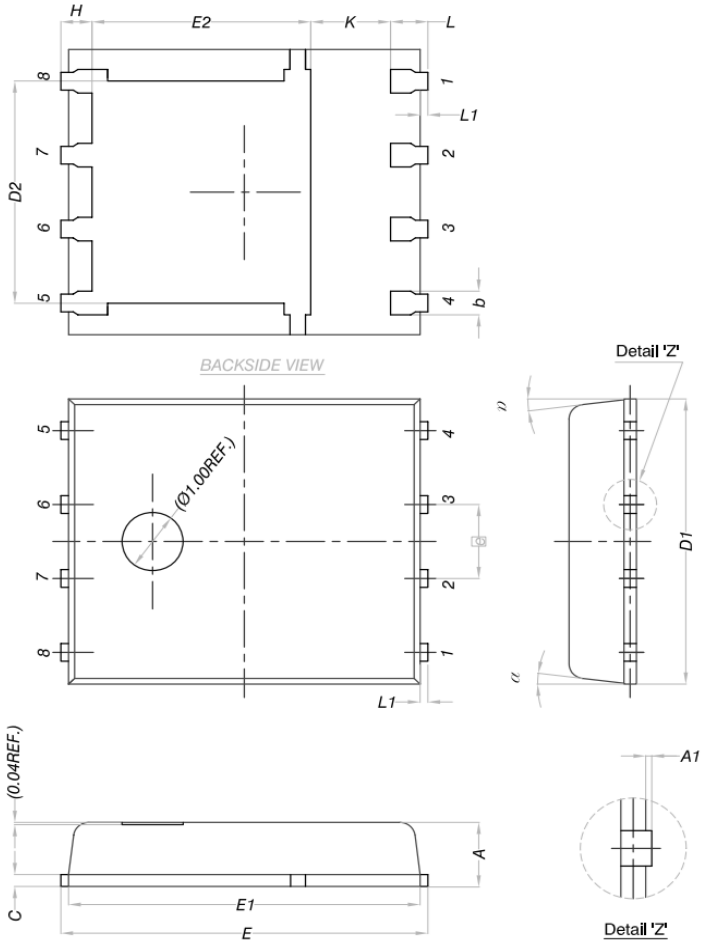



Fig.16 Gate Charge Waveform



## ●Dimensions（DFN5×6）

Unit：mm




| DIM. | MILLIMETERS | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | 0.90 | 1.00 | 1.10 |
| A1 | 0 | - | 0.05 |
| b | 0.33 | 0.41 | 0.51 |
| C | 0.20 | 0.25 | 0.30 |
| D1 | 4.80 | 4.90 | 5.00 |
| D2 | 3.61 | 3.81 | 3.96 |
| E | 5.90 | 6.00 | 6.10 |
| E1 | 5.70 | 5.75 | 5.80 |
| E2 | 3.38 | 3.58 | 3.78 |
| e | 1.27 BSC | | |
| H | 0.41 | 0.51 | 0.61 |
| K | 1.10 | - | - |
| L | 0.51 | 0.61 | 0.71 |
| L1 | 0.06 | 0.13 | 0.20 |
| α | 0° | - | 12° |