

• General Description

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

• Features

- AEC-Q101 Qualified
- Low $R_{DS(ON)}$ to minimize conductive loss
- Low Gate Charge for fast switching
- Low Thermal resistance

• Application

- BLDC Motor driver
- DC-DC
- Load Switch

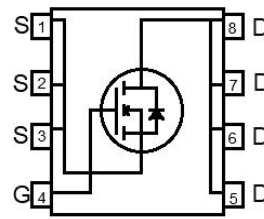
• Ordering Information:

| | |
|---------------------------|---------------|
| Part NO. | ZMSA005N04HNC |
| Marking | ZMS005N04H |
| Packing Information | REEL TAPE |
| Basic ordering unit (pcs) | 3000 |

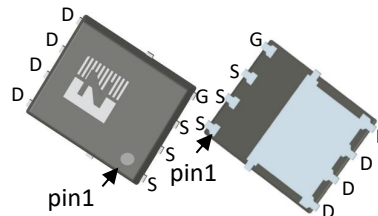
• Absolute Maximum Ratings ($T_C=25^{\circ}C$)

| Parameter | Symbol | Conditions | Value | Unit |
|----------------------------------|-----------|--|-------------|-------------|
| Drain-Source Voltage | V_{DS} | | 40 | V |
| Gate-Source Voltage ^① | V_{GS} | | ±20 | V |
| Continuous Drain Current | I_D | $T_C=25^{\circ}C$ | 360 | A |
| | I_D | $T_C=75^{\circ}C$ | 299 | A |
| | I_D | $T_C=100^{\circ}C$ | 259 | A |
| Pulsed Drain Current | I_{DM} | Pulsed; $t_p \leq 10 \mu s$; $T_{mb} = 25^{\circ}C$; | 1080 | A |
| Total Power Dissipation | P_D | $T_C=25^{\circ}C$ | 188 | W |
| Total Power Dissipation | P_D | $T_A=25^{\circ}C$ | 4.2 | W |
| Operating Junction Temperature | T_J | | -55 to +175 | $^{\circ}C$ |
| Storage Temperature | T_{STG} | | -55 to +175 | $^{\circ}C$ |
| Single Pulse Avalanche Energy | E_{AS} | L=0.1mH, $V_{GS}=10V$, $R_g=25\Omega$, | 480 | mJ |
| | | L=0.5mH, $V_{GS}=10V$, $R_g=25\Omega$, | 768 | mJ |
| ESD Level (HBM) | CLASS 2 | | | |

• Product Summary



$V_{DS} = 40V$
 $R_{DS(ON)} = 0.58m\Omega$
 $I_D = 360A$



DFN5*6



•Thermal resistance

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|--------------------------------------|----------------|------|------|------|------|
| Thermal resistance, junction - case | R_{thJC} | | - | 0.8 | °C/W |
| Thermal resistance, junction-ambient | $R_{thJA}^{②}$ | | - | 36 | °C/W |
| Soldering temperature | T_{sold} | | - | 260 | °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 | 2.7 | 4 | V |
| Drain-Source Leakage Current | I_{DSS} | $V_{GS} = 0V, V_{DS} = 40V$ | | | 1.0 | μA |
| Gate- Source Leakage Current | I_{GSS} | $V_{GS} = \pm 20V, V_{DS} = 0V$ | | | 100 | nA |
| Static Drain-source On Resistance | $R_{DS(ON)}$ | $V_{GS} = 10V, I_D = 40A$ | | 0.58 | 0.75 | m Ω |
| Forward Transconductance | g_{FS} | $V_{DS} = 5V, I_{SD} = 10A$ | | 30 | | S |
| Diode Forward Voltage | V_{FSD} | $V_{GS} = 0V, I_{SD} = 40A$ | | | 1.3 | V |

•Dynamic characteristics

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|------------------------------|--------------|--|------|------|------|----------|
| Input capacitance | C_{iss} | $f = 1MHz, V_{DS} = 25V$ | - | 6900 | - | pF |
| Output capacitance | C_{oss} | | - | 2100 | - | |
| Reverse transfer capacitance | C_{rss} | | - | 86 | - | |
| Gate Resistance | R_g | $f = 1MHz$ | - | 1.4 | | Ω |
| Total gate charge | Q_g | $V_{DD} = 15V, I_D = 20A, V_{GS} = 10V$ | - | 94 | - | nC |
| Gate - Source charge | Q_{gs} | | - | 21 | - | |
| Gate - Drain charge | Q_{gd} | | - | 26 | - | |
| Turn-ON Delay time | $t_{D(on)}$ | $V_{GS} = 10V, V_{DS} = 15V, R_G = 3.3\Omega, I_D = 20A$ | - | 39 | - | ns |
| Turn-ON Rise time | t_r | | - | 42 | - | ns |
| Turn-Off Delay time | $t_{D(off)}$ | | - | 31 | - | ns |
| Turn-Off Fall time | t_f | | - | 12 | - | ns |
| Reverse Recovery Time | t_{RR} | $V_{DD} = 20V, dI_S/dt = 100A/\mu s, I_S = 50A$ | - | 72 | - | ns |
| Reverse Recovery Charge | Q_{RR} | | - | 85 | - | nC |

Fig.1 Gate-Charge Characteristics

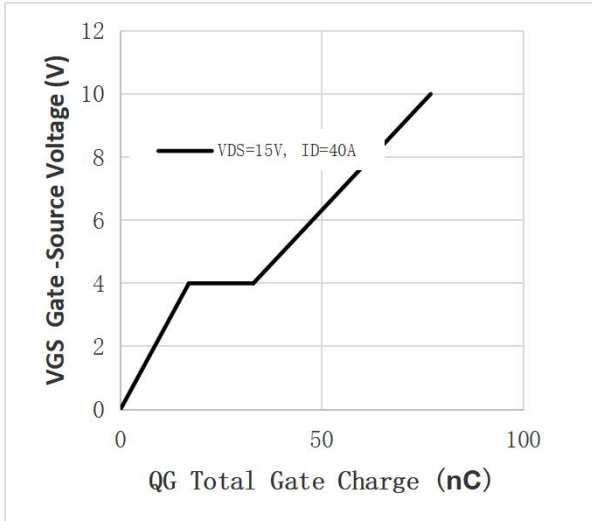


Fig.2 Capacitance Characteristics

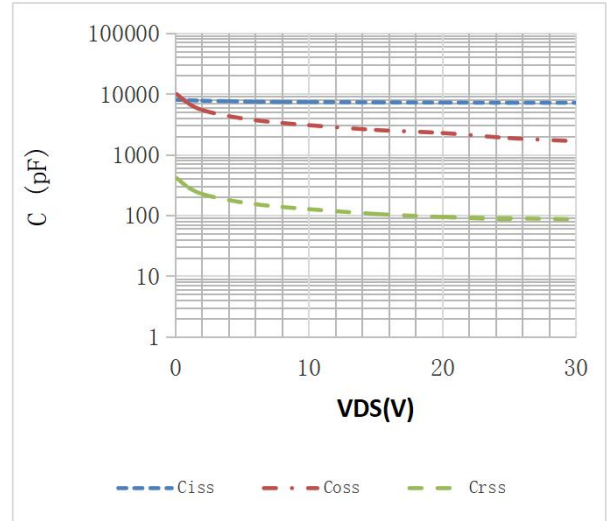


Fig.3 Power Dissipation

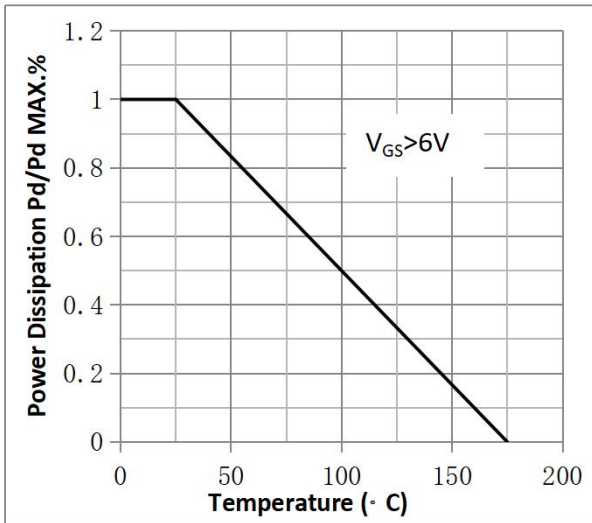


Fig.4 Typical output Characteristics

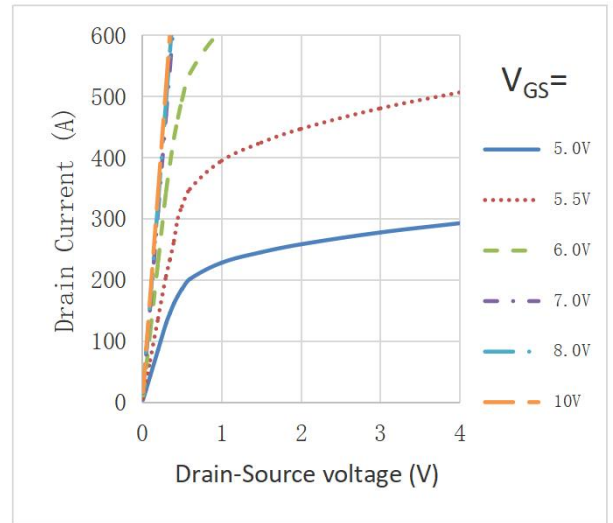


Fig.5 Threshold Voltage V.S Junction Temperature

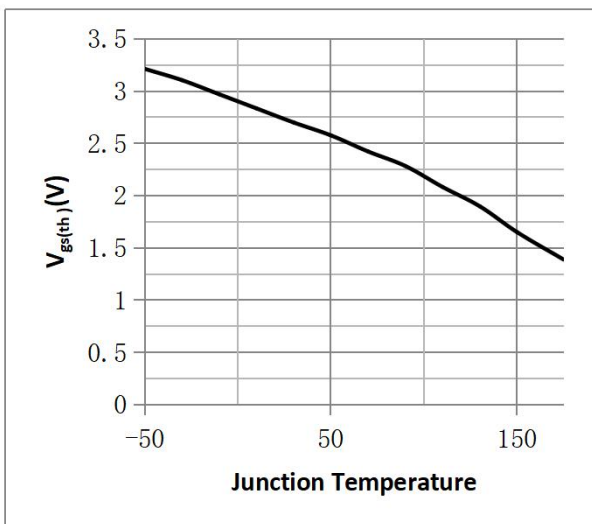


Fig.6 Resistance V.S Drain Current

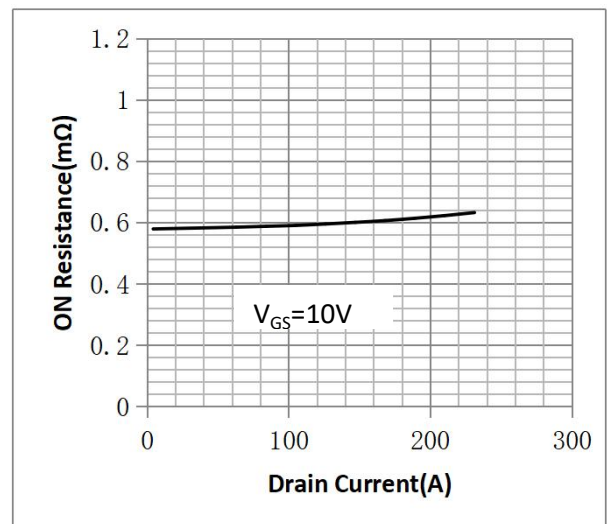


Fig.7 On-Resistance VS Gate Source Voltage

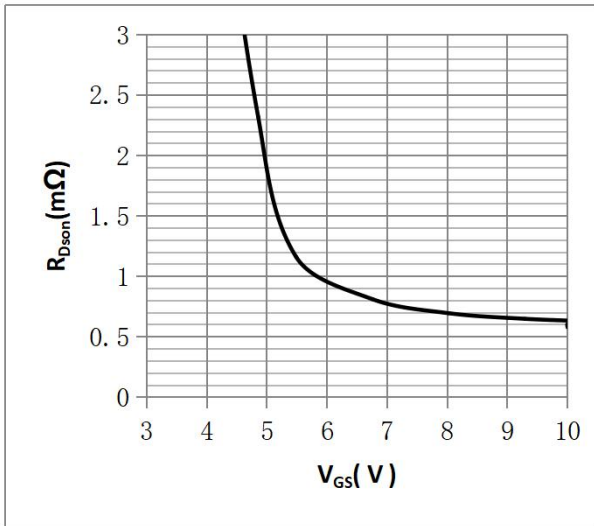


Fig.8 On-Resistance V.S Junction Temperature

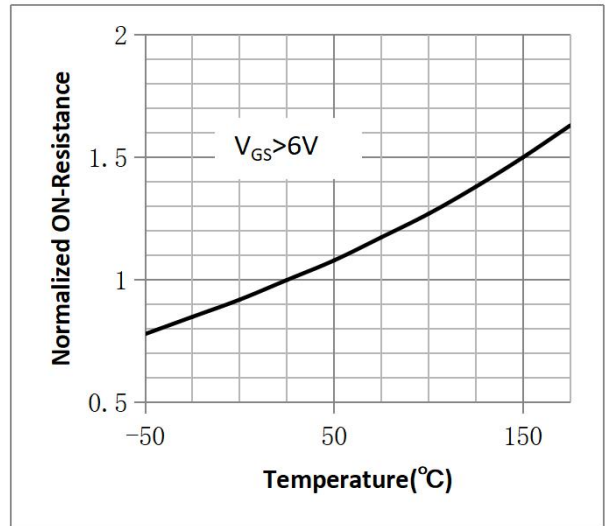


Figure 9. Diode Forward Voltage vs. Current

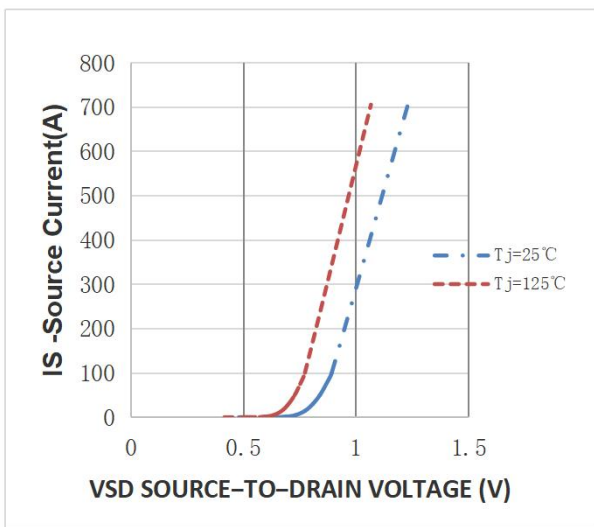


Figure 10. Transfer Characteristics

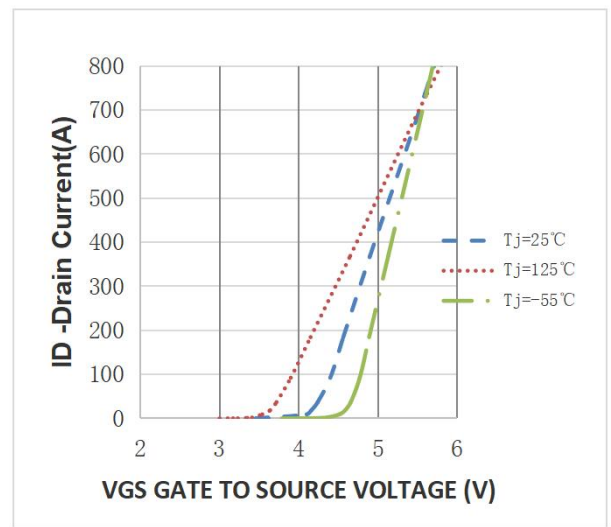


Fig.11 Safe Operating Area

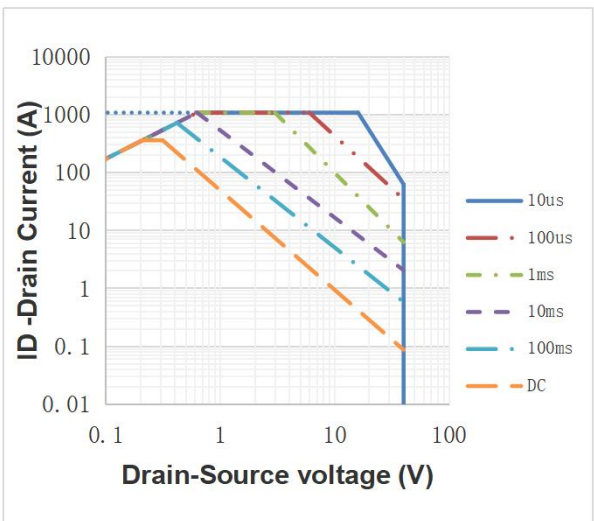
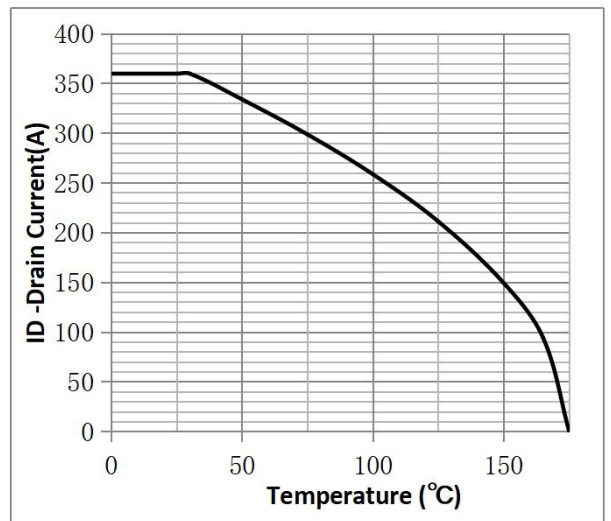
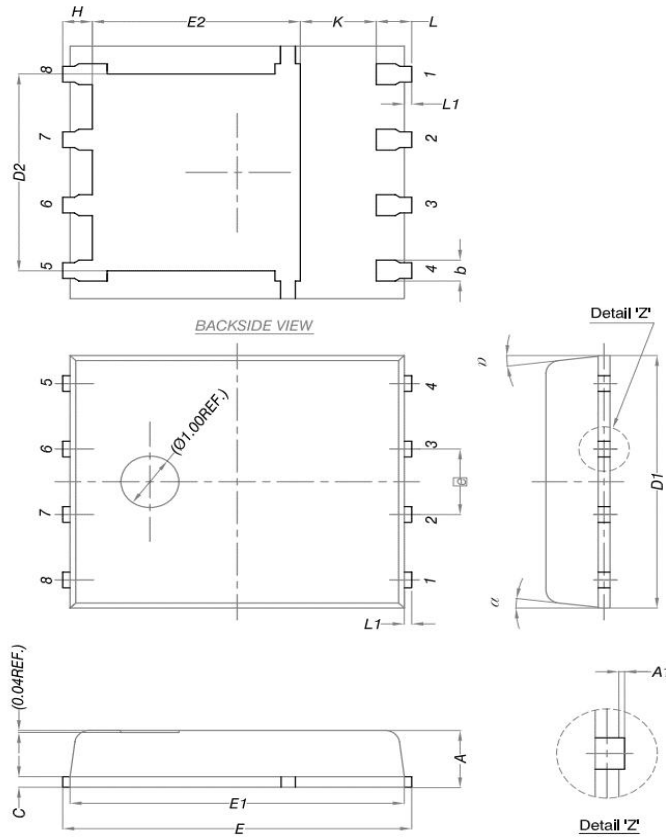


Fig.12 ID vs. Junction Temperature^③



•DFN5*6 Package Outline



| 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° |

Note:

- ① Pulse : $V_{GS}=+20V/-20V$, Duty cycle=50%, $T_j=175^{\circ}C$, $t=1000$ hours; For DC , the following test conditions can be passed: $V_{GS}=+20V/-10V$, $T_j=175^{\circ}C$, $t=1000$ hours;
- ② Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate;
- ③ Practically the current will be limited by PCB, thermal design and operating temperature. $V_{GS}=10V$.

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Revision History

| Version | Date | Change |
|---------|------------|---|
| A | 2022.11.10 | new |
| B | 2023.6.25 | correct IDcurve |
| C | 2024.2.29 | correct CISS, QG |
| D | 2024.4.16 | Modified switch time, Dynamic characteristics |
| | | |
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