

• 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
- Battery protection

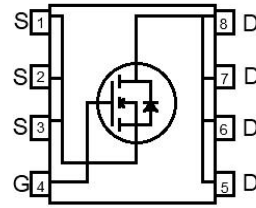
• Ordering Information:

|                           |              |
|---------------------------|--------------|
| Part NO.                  | ZMSA018N04HN |
| Marking                   | ZMS018N04H   |
| Packing Information       | REEL TAPE    |
| Basic ordering unit (pcs) | 3000         |

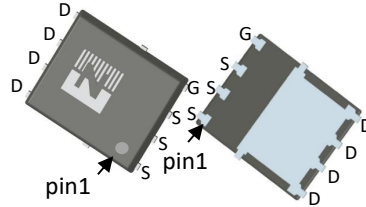
• Absolute Maximum Ratings ( $T_C=25^\circ\text{C}$ )

| Parameter                        | Symbol    | Conditions  | Value       | Unit             |
|----------------------------------|-----------|---|-------------|------------------|
| Drain-Source Voltage             | $V_{DS}$  |   | 40          | V                |
| Gate-Source Voltage <sup>①</sup> | $V_{GS}$  |   | $\pm 20$    | V                |
| Continuous Drain Current         | $I_D$     | $T_C=25^\circ\text{C}$  | 120         | A                |
|                                  | $I_D$     | $T_C=75^\circ\text{C}$  | 120         | A                |
|                                  | $I_D$     | $T_C=100^\circ\text{C}$   | 109         | A                |
| Pulsed Drain Current             | $I_{DM}$  | Pulsed; $t_p \leq 10 \mu\text{s}$ ; $T_{mb} = 25^\circ\text{C}$ ; | 480         | A                |
| Total Power Dissipation          | $P_D$     | $T_C=25^\circ\text{C}$  | 107         | W                |
| Total Power Dissipation          | $P_D$     | $T_A=25^\circ\text{C}$  | 3.3         | W                |
| Operating Junction Temperature   | $T_J$     |   | -55 to +175 | $^\circ\text{C}$ |
| Storage Temperature              | $T_{STG}$ |   | -55 to +175 | $^\circ\text{C}$ |
| Single Pulse Avalanche Energy    | $E_{AS}$  | $L=0.1\text{mH}$ , $V_{GS}=10\text{V}$ , $R_g=25\Omega$ ,         | 210         | mJ               |
|                                  |           | $L=0.5\text{mH}$ , $V_{GS}=10\text{V}$ , $R_g=25\Omega$ ,         | 460         | mJ               |
| ESD Level (HBM)                  | CLASS 2   |   |             |                  |

• Product Summary



$V_{DS} = 40\text{V}$   
 $R_{DS(ON)} = 1.8\text{m}\Omega$   
 $I_D = 120\text{A}$



DFN5\*6



**•Thermal resistance**

| Parameter                            | Symbol             | Min. | Typ. | Max. | Unit |
|--------------------------------------|--------------------|------|------|------|------|
| Thermal resistance, junction - case  | RthJC              |      | -    | 1.4  | °C/W |
| Thermal resistance, junction-ambient | RthJA <sup>②</sup> |      | -    | 45   | °C/W |
| Soldering temperature                | Tsold              |      | -    | 260  | °C   |

**•Electronic Characteristics**

| Parameter                         | Symbol              | Condition  | Min. | Typ. | Max. | Unit |
|-----------------------------------|---------------------|--|------|------|------|------|
| Drain-Source Breakdown Voltage    | BV <sub>DSS</sub>   | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250uA               | 40   |      |      | V    |
| Gate Threshold Voltage            | V <sub>GS(TH)</sub> | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250uA | 2.0  | 2.7  | 4.0  | V    |
| Drain-Source Leakage Current      | I <sub>DSS</sub>    | V <sub>GS</sub> = 0V, V <sub>DS</sub> = 40V                |      |      | 1.0  | uA   |
| Gate- Source Leakage Current      | I <sub>GSS</sub>    | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V               |      |      | 100  | nA   |
| Static Drain-source On Resistance | R <sub>DS(ON)</sub> | V <sub>GS</sub> = 10V, I <sub>D</sub> = 40A                |      | 1.8  | 2.4  | mΩ   |
| Forward Transconductance          | g <sub>FS</sub>     | V <sub>DS</sub> = 5V, I <sub>SD</sub> = 10A                |      | 15   |      | s    |
| Diode Forward Voltage             | V <sub>FSD</sub>    | V <sub>GS</sub> = 0V, I <sub>SD</sub> = 40A                |      |      | 1.3  | V    |

**•Dynamic characteristics**

| Parameter                    | Symbol              | Condition  | Min. | Typ. | Max. | Unit |
|------------------------------|---------------------|--|------|------|------|------|
| Input capacitance            | Ciss                | f = 1MHz, V <sub>DS</sub> = 25V  | -    | 3310 | -    | pF   |
| Output capacitance           | Coss                |  | -    | 853  | -    |      |
| Reverse transfer capacitance | Crss                |  | -    | 47   | -    |      |
| Gate Resistance              | Rg                  | f = 1MHz   | -    | 1.9  |      | Ω    |
| Total gate charge            | Qg                  | V <sub>DD</sub> = 15V,<br>I <sub>D</sub> = 20A,<br>V <sub>GS</sub> = 10V                     | -    | 49   | -    | nC   |
| Gate - Source charge         | Qgs                 |  | -    | 11.6 | -    |      |
| Gate - Drain charge          | Qgd                 |  | -    | 11.9 | -    |      |
| Turn-ON Delay time           | t <sub>D(on)</sub>  | V <sub>GS</sub> = 10V, V <sub>DS</sub> = 15V,<br>R <sub>G</sub> = 3.3Ω, I <sub>D</sub> = 20A | -    | 10   | -    | ns   |
| Turn-ON Rise time            | t <sub>r</sub>      |  | -    | 9    | -    | ns   |
| Turn-Off Delay time          | t <sub>D(off)</sub> |  | -    | 16   | -    | ns   |
| Turn-Off Fall time           | t <sub>f</sub>      |  | -    | 12   | -    | ns   |
| Reverse Recovery Time        | t <sub>RR</sub>     | V <sub>DD</sub> = 20V, dI <sub>S</sub> /dt =<br>100A/us, I <sub>S</sub> = 50A                | -    | 52   | -    | ns   |
| Reverse Recovery Charge      | Q <sub>RR</sub>     |  | -    | 61   | -    | nC   |

Fig.1 Gate-Charge Characteristics

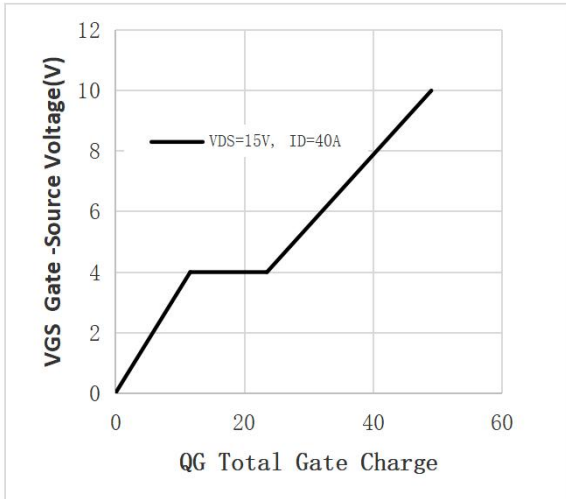


Fig.2 Capacitance Characteristics

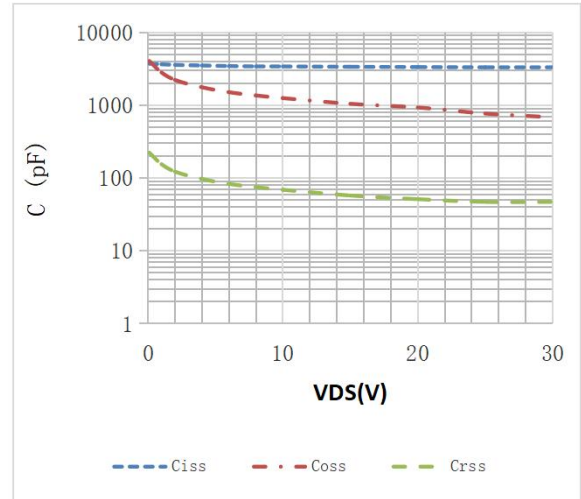


Fig.3 Power Dissipation

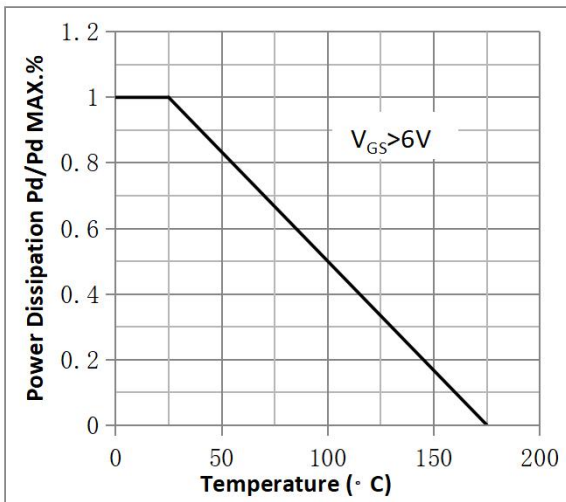


Fig.4 Typical output Characteristics

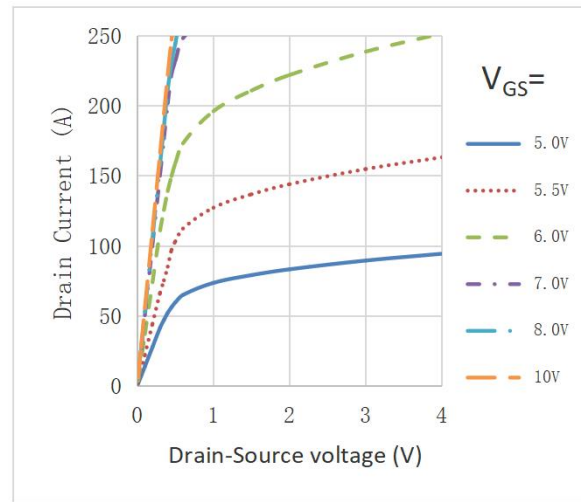


Fig.5 Threshold Voltage V.S Junction Temperature

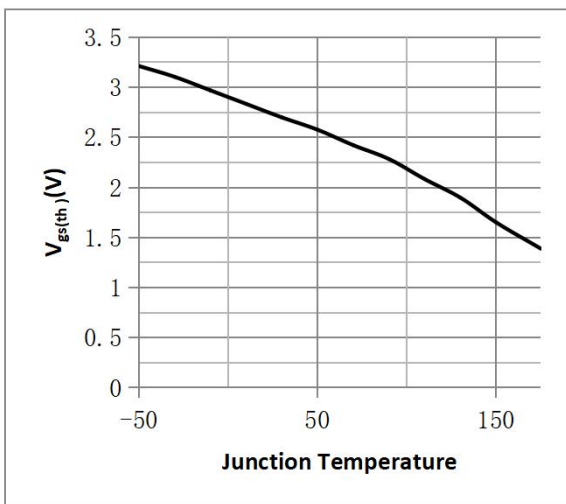


Fig.6 Resistance V.S Drain Current

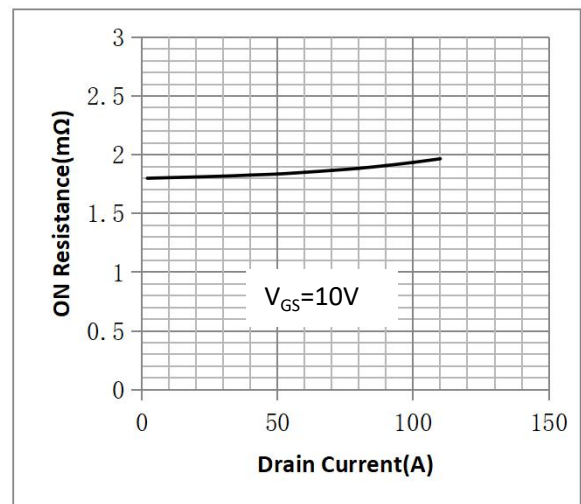


Fig.7 On-Resistance VS Gate Source Voltage

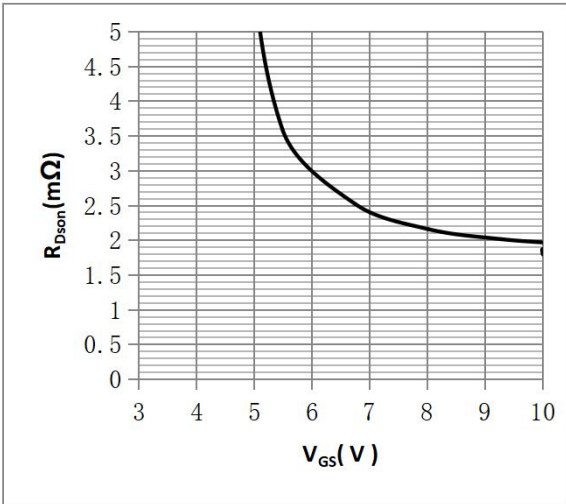


Fig.8 On-Resistance V.S Junction Temperature

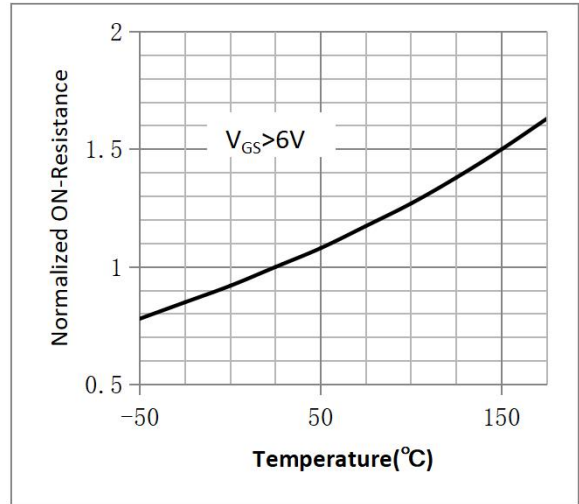


Figure 9. Diode Forward Voltage vs. Current

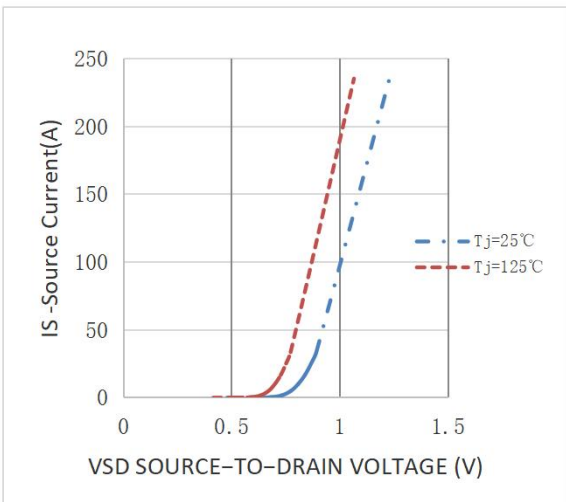


Figure 10. Transfer Characteristics

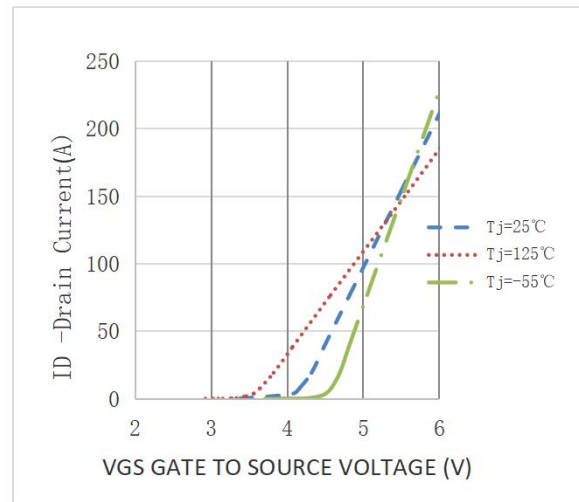


Fig.11 Safe Operating Area

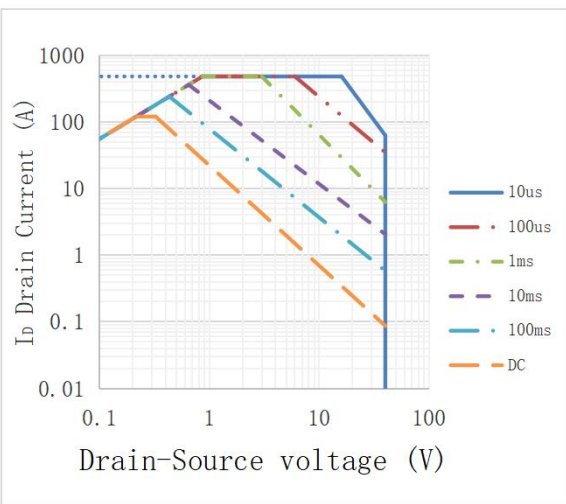
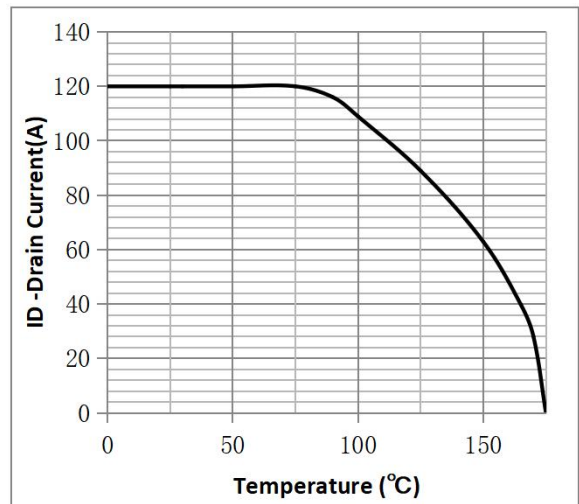
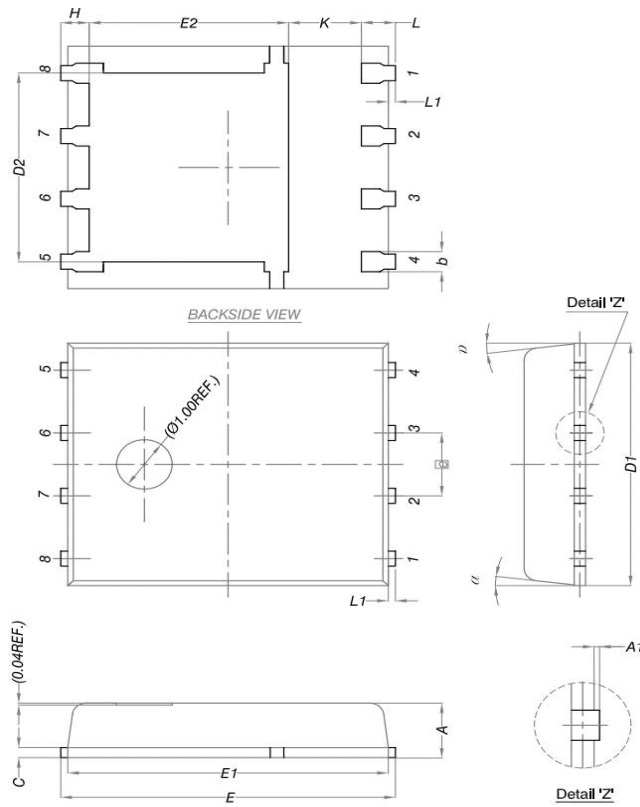


Fig.12 ID vs. Case Temperature<sup>③</sup>



•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       | 2022.1.6   |   |
| B       | 2022.2.26  | 1.Add Dynamic characteristic $t_f$ , $t_r$ etc.                 |
| C       | 2022.9.5   | 1.Add Reach, HF figure, 2.ID modify<br>2.temperature 265->260°C |
| D       | 2022.11.30 | temperature change to Case temperature                          |
|         |            |   |
|         |            |   |
|         |            |   |
|         |            |   |