

## General Description

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

## 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

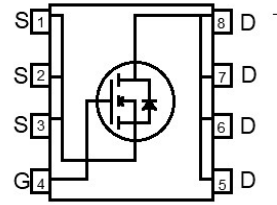
## Ordering Information:

|                           |             |
|---------------------------|-------------|
| Part NO.                  | ZMSA420N10N |
| Marking                   | ZMS420N10   |
| 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             | $V_{DS}$  |                                                                   | 100         | V                |
| Gate-Source Voltage <sup>①</sup> | $V_{GS}$  |                                                                   | $\pm 20$    | V                |
| Continuous Drain Current         | $I_D$     | $T_C=25^\circ\text{C}$                                            | 20          | A                |
|                                  | $I_D$     | $T_C=75^\circ\text{C}$                                            | 17          | A                |
|                                  | $I_D$     | $T_C=100^\circ\text{C}$                                           | 15          | A                |
| Pulsed Drain Current             | $I_{DM}$  | Pulsed; $t_p \leq 10 \mu\text{s}$ ; $T_{mb} = 25^\circ\text{C}$ ; | 60          | A                |
| Total Power Dissipation          | $P_D$     | $T_C=25^\circ\text{C}$                                            | 33          | 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    | $E_{AS}$  | $L=0.1\text{mH}$ , $V_{GS}=10\text{V}$ , $R_g=25\Omega$ ,         | 10          | mJ               |
|                                  |           | $L=0.5\text{mH}$ , $V_{GS}=10\text{V}$ , $R_g=25\Omega$ ,         | 21          | mJ               |
| ESD Level (HBM)                  | CLASS 1B  |                                                                   |             |                  |

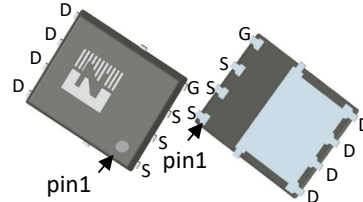
## Product Summary



$$V_{DS} = 100\text{V}$$

$$R_{DS(ON)} = 50\text{m}\Omega$$

$$I_D = 20\text{A}$$



DFN5\*6



**•Thermal resistance**

| Parameter                                         | Symbol     | Min. | Typ. | Max. | Unit |
|---------------------------------------------------|------------|------|------|------|------|
| Thermal resistance, junction - case               | $R_{thJC}$ |      | -    | 4.5  | °C/W |
| Thermal resistance, junction-ambient <sup>②</sup> | $R_{thJA}$ |      | -    | 45   | °C/W |
| Soldering temperature (total time<10s)            | Tsold      |      | -    | 260  | °C   |

**•Electronic Characteristics**

| Parameter                         | Symbol       | Condition                     | Min. | Typ. | Max. | Unit       |
|-----------------------------------|--------------|-------------------------------|------|------|------|------------|
| Drain-Source Breakdown Voltage    | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$     | 100  |      |      | V          |
| Gate Threshold Voltage            | $V_{GS(TH)}$ | $V_{GS}=V_{DS}, I_D=250\mu A$ | 1.3  | 1.8  | 2.5  | V          |
| Drain-Source Leakage Current      | $I_{DSS}$    | $V_{GS}=0V, V_{DS}=100V$      |      |      | 1.0  | $\mu A$    |
| Gate- Source Leakage Current      | $I_{GSS}$    | $V_{GS}=\pm 20V, V_{DS}=0V$   |      |      | 100  | nA         |
| Static Drain-source On Resistance | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=10A$         |      | 50   | 65   | m $\Omega$ |
|                                   |              | $V_{GS}=4.5V, I_D=6A$         |      | 64   | 83   | m $\Omega$ |
| Forward Transconductance          | $g_{FS}$     | $V_{GS}=5V, I_{SD}=10A$       |      | 4    |      | S          |
| Diode Forward Voltage             | $V_{FSD}$    | $V_{GS}=0V, I_{SD}=10A$       |      |      | 1.3  | V          |

**•Dynamic characteristics**

| Parameter                    | Symbol       | Condition                                        | Min. | Typ. | Max. | Unit     |
|------------------------------|--------------|--------------------------------------------------|------|------|------|----------|
| Input capacitance            | $C_{iss}$    | $f=1MHz, V_{DS}=25V$                             | -    | 275  | -    | pF       |
| Output capacitance           | $C_{oss}$    |                                                  | -    | 146  | -    |          |
| Reverse transfer capacitance | $C_{rss}$    |                                                  | -    | 3.7  | -    |          |
| Gate Resistance              | $R_g$        | $f=1MHz$                                         | -    | 1.3  |      | $\Omega$ |
| Total gate charge            | $Q_g$        | $V_{DD}=15V, I_D=20A, V_{GS}=10V$                | -    | 7    | -    | nC       |
|                              | $Q_g(4.5V)$  |                                                  | -    | 4    | -    |          |
| Gate - Source charge         | $Q_{gs}$     |                                                  | -    | 2.1  | -    |          |
| Gate - Drain charge          | $Q_{gd}$     |                                                  | -    | 1.1  | -    |          |
| Turn-ON Delay time           | $t_{D(on)}$  | $V_{GS}=10V, V_{DS}=15V, R_G=3.3\Omega, I_D=20A$ | -    | 10   | -    | ns       |
| Turn-ON Rise time            | $t_r$        |                                                  | -    | 4.2  | -    | ns       |
| Turn-Off Delay time          | $t_{D(off)}$ |                                                  | -    | 15   | -    | ns       |
| Turn-Off Fall time           | $t_f$        |                                                  | -    | 4.4  | -    | ns       |
| Reverse Recovery Time        | $t_{RR}$     | $V_{DD}=20V, dI_S/dt=100A/\mu s, I_S=20A$        | -    | 57   | -    | ns       |
| Reverse Recovery Charge      | $Q_{RR}$     |                                                  | -    | 80   | -    | nC       |

Fig.1 Gate-Charge Characteristics

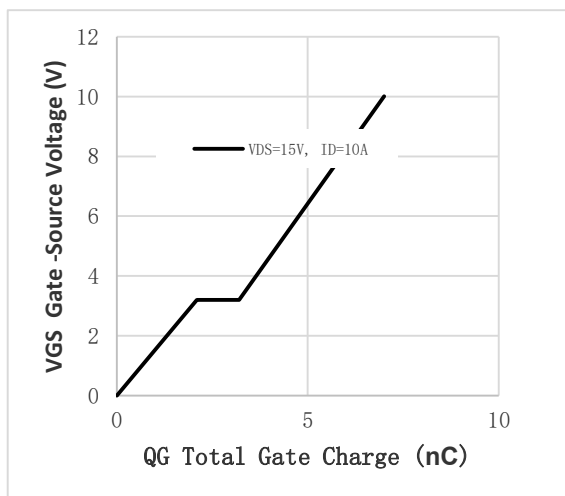


Fig.2 Capacitance Characteristics

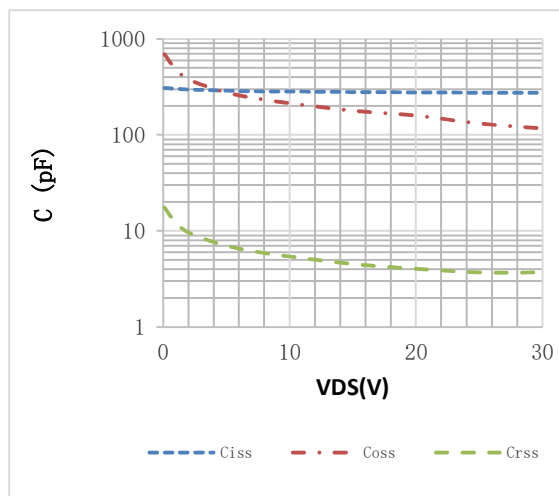


Fig.3 Power Dissipation

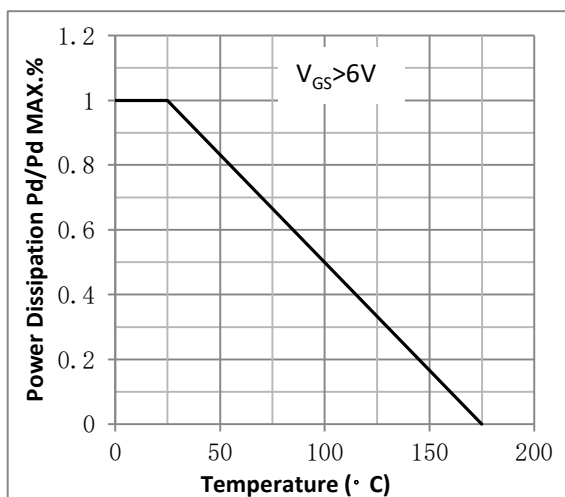


Fig.4 Typical output Characteristics

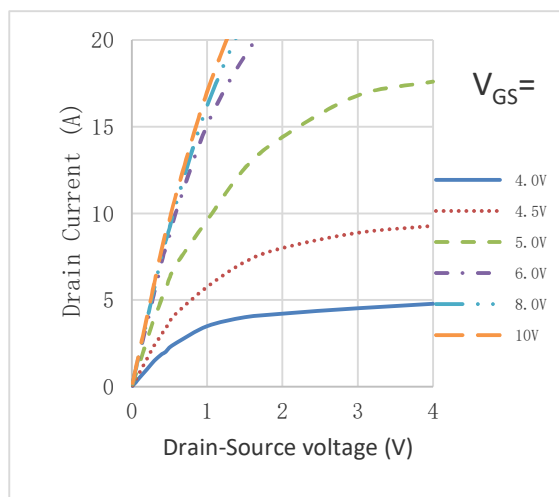


Fig.5 Threshold Voltage V.S Junction Temperature

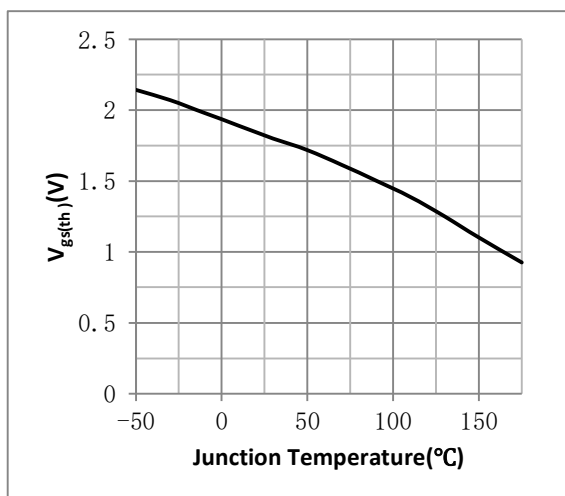


Fig.6 Resistance V.S Drain Current

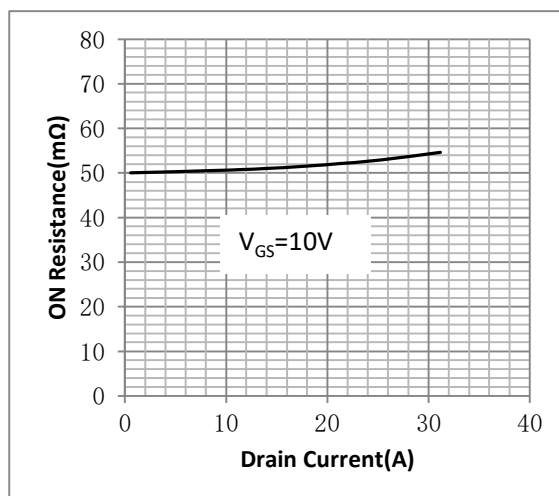


Fig.7 On-Resistance VS Gate Source Voltage

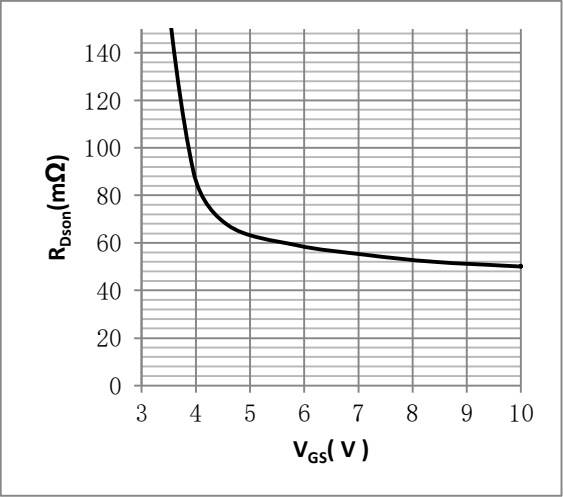


Fig.8 On-Resistance V.S Junction Temperature

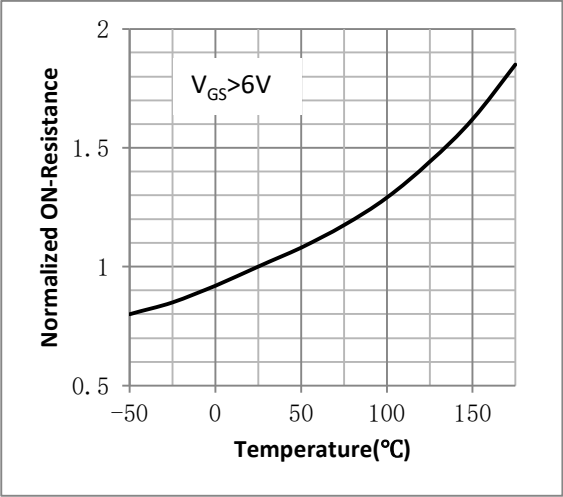


Figure 9. Diode Forward Voltage vs. Current

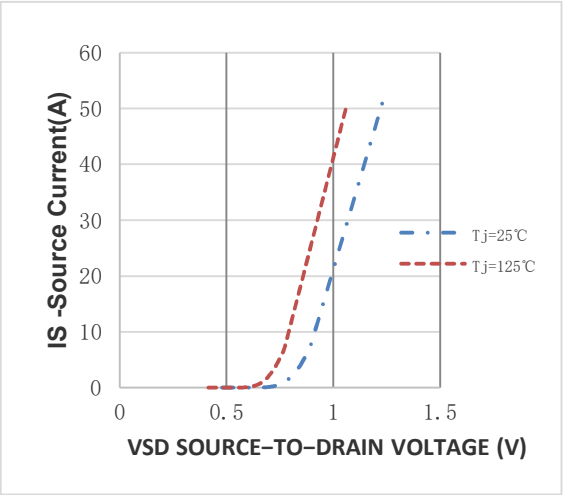


Figure 10. Transfer Characteristics

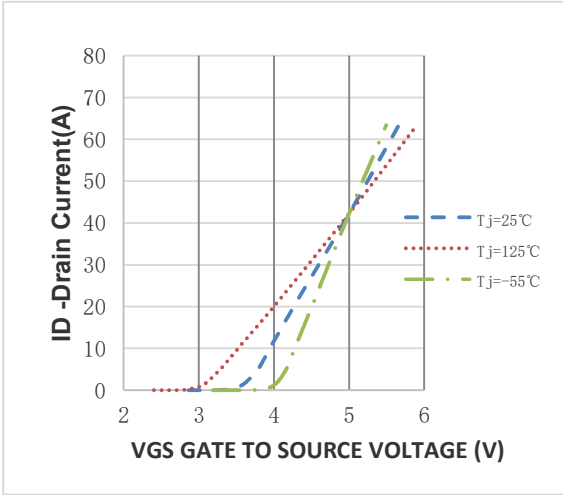


Fig.11 Safe Operating Area

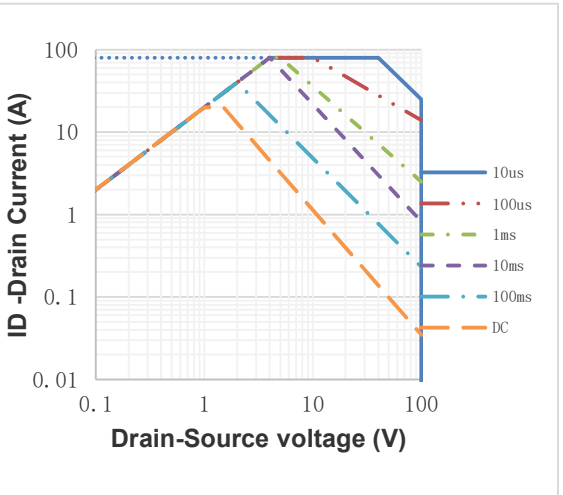
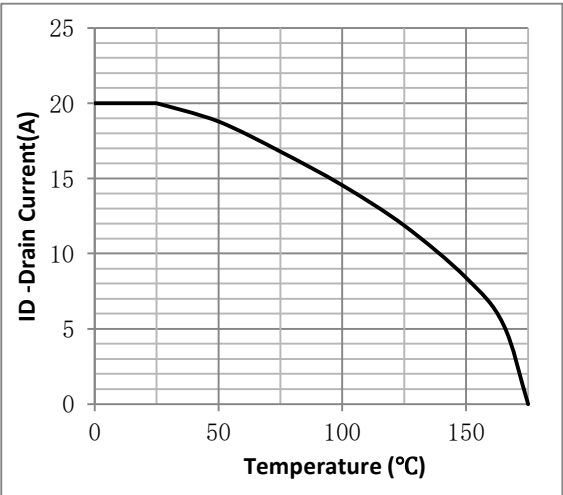
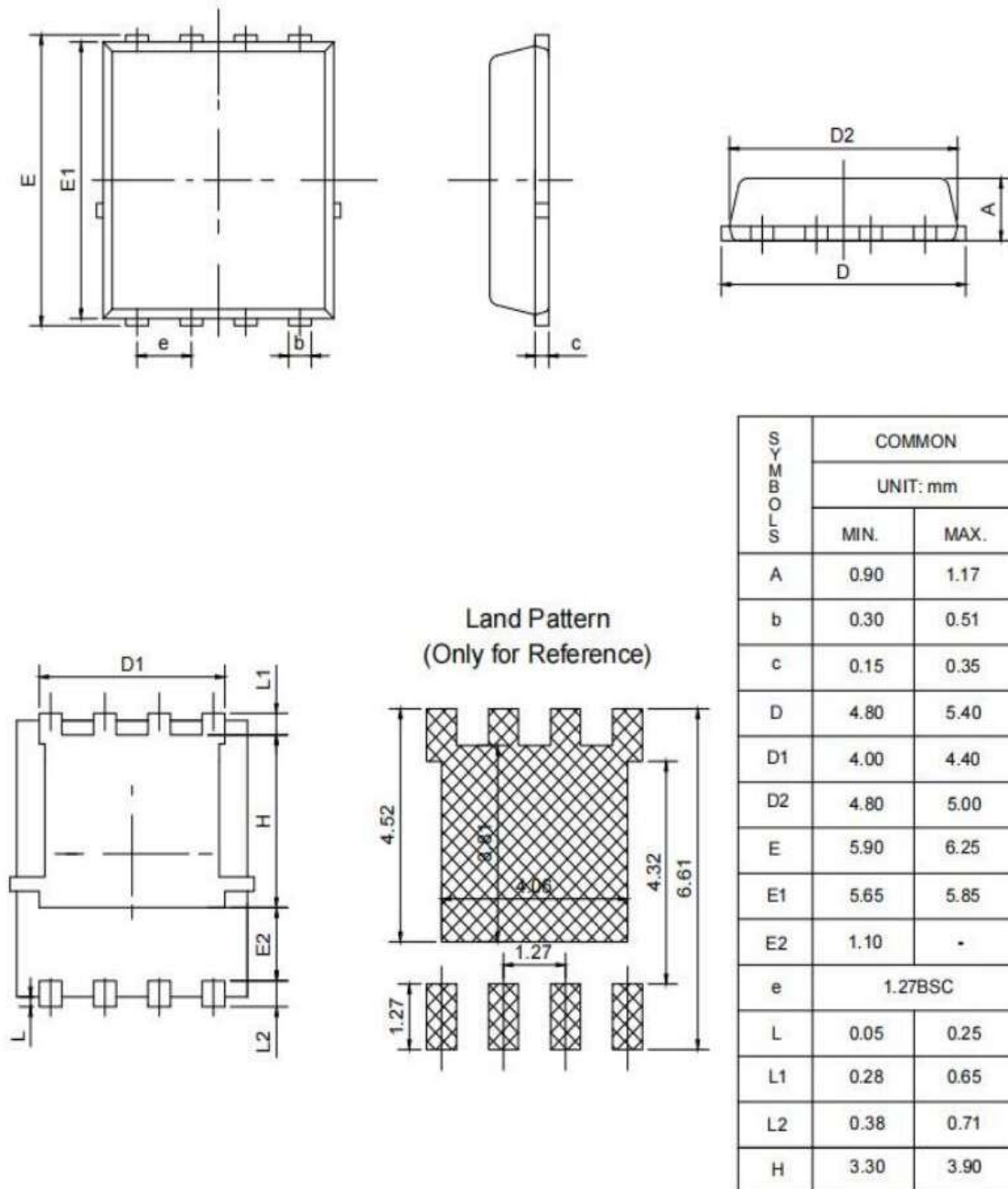


Fig.12 ID vs. Case Temperature<sup>③</sup>



•DFN5\*6 Package Outline



**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       | 2022.1.10  |                                                                                                                      |
| B       | 2022.10.20 | 1.Add Reach,HF figure,2.Fig1~12 modify 3.Add It is suitable for automotive application.4.Add Dynamic characteristics |
| C       | 2025.10.21 | Correct package outline dimension and add reference land pattern                                                     |
|         |            |                                                                                                                      |
|         |            |                                                                                                                      |
|         |            |                                                                                                                      |