

• 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

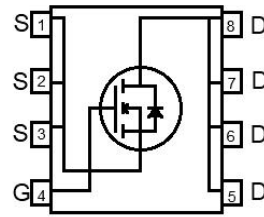
• Ordering Information:

Part NO.	ZMSA090N06M
Marking	090N06
Packing Information	REEL TAPE
Basic ordering unit (pcs)	5000

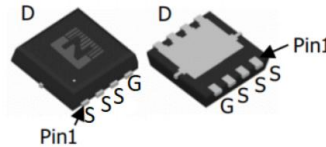
• Absolute Maximum Ratings ( $T_C=25^\circ\text{C}$ )

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	$V_{DS}$		60	V
Gate-Source Voltage <sup>①</sup>	$V_{GS}$		$\pm 20$	V
Continuous Drain Current	$I_D$	$T_C=25^\circ\text{C}$	35	A
	$I_D$	$T_C=75^\circ\text{C}$	28	A
	$I_D$	$T_C=100^\circ\text{C}$	25	A
Pulsed Drain Current	$I_{DM}$	Pulsed; $t_p \leq 10 \mu\text{s}$ ; $T_{mb} = 25^\circ\text{C}$ ;	140	A
Total Power Dissipation	$P_D$	$T_C=25^\circ\text{C}$	27	W
Total Power Dissipation	$P_D$	$T_A=25^\circ\text{C}$	2.5	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	$E_{AS}$	$L=0.1\text{mH}$ , $V_{GS}=10\text{V}$ , $R_g=25\Omega$ ,	47	mJ
		$L=0.5\text{mH}$ , $V_{GS}=10\text{V}$ , $R_g=25\Omega$ ,	99	mJ
ESD Level (HBM)	CLASS 1B			

• Product Summary



$V_{DS} = 60\text{V}$   
 $R_{DS(ON)} = 9\text{m}\Omega$   
 $I_D = 35\text{A}$



DFN3\*3



**•Thermal resistance**

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	$R_{thJC}$		-	5.6	°C/W
Thermal resistance, junction-ambient <sup>②</sup>	$R_{thJA}$		-	60	°C/W
Soldering temperature	$T_{sold}$		-	260	°C

**•Electronic Characteristics**

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	60			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	$I_{DSS}$	$V_{GS}=0V, V_{DS}=60V$			1.0	$\mu A$
Gate- Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$			100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=12A$		9	11	m $\Omega$
		$V_{GS}=4.5V, I_D=10A$		12	17	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_{SD}=10A$		14		S
Diode Forward Voltage	$V_{FSD}$	$V_{GS}=0V, I_{SD}=12A$			1.3	V

**•Dynamic characteristics**

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	
Input capacitance	$C_{iss}$	$f=1MHz, V_{DS}=25V$	-	960	-	pF	
Output capacitance	$C_{oss}$		-	530	-		
Reverse transfer capacitance	$C_{rss}$		-	65	-		
Gate Resistance	$R_g$	$f=1MHz$	-	1.4		$\Omega$	
Total gate charge	$Q_g$	$V_{DD}=15V, I_D=20A, V_{GS}=10V$	-	13	-	nC	
	$Q_g(4.5v)$		-	6	-		
	Gate - Source charge		$Q_{gs}$	-	2.55		-
	Gate - Drain charge		$Q_{gd}$	-	2.46		-
Turn-ON Delay time	$t_{D(on)}$	$V_{GS}=10V, V_{DS}=15V, R_G=3.3\Omega, I_D=20A$	-	16	-	ns	
Turn-ON Rise time	$t_r$		-	40	-	ns	
Turn-Off Delay time	$t_{D(off)}$		-	20	-	ns	
Turn-Off Fall time	$t_f$		-	5	-	ns	
Reverse Recovery Time	$t_{RR}$	$V_{DD}=20V, di_S/dt=100A/\mu s, I_S=20A$	-	45	-	ns	
Reverse Recovery Charge	$Q_{RR}$		-	40	-	nC	

Fig.1 Gate-Charge Characteristics

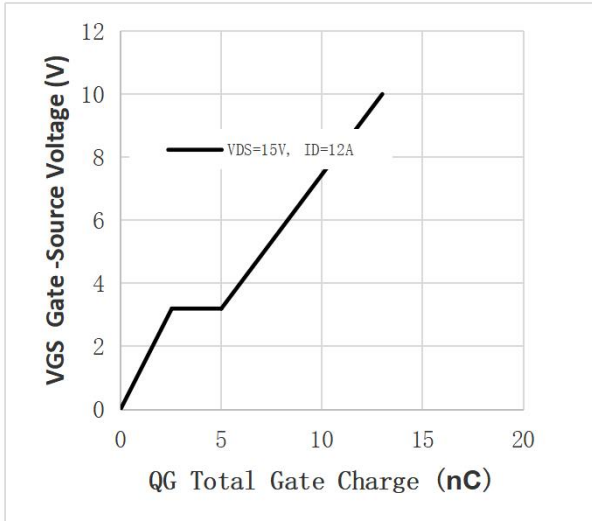


Fig.2 Capacitance Characteristics

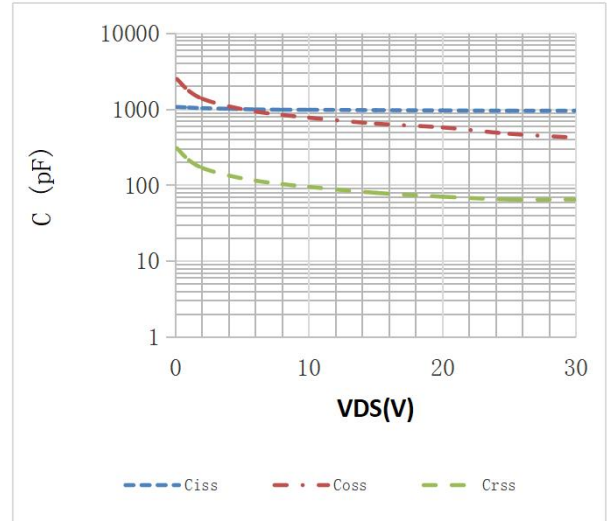


Fig.3 Power Dissipation

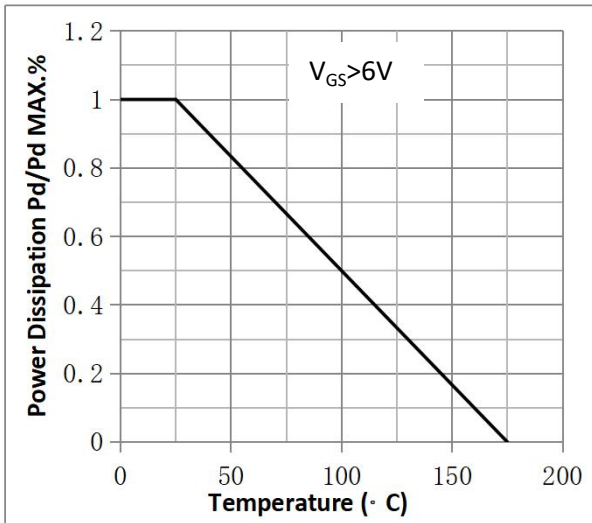


Fig.4 Typical output Characteristics

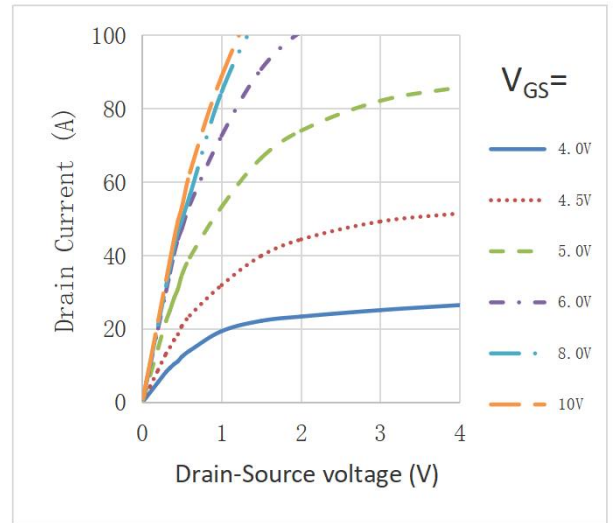


Fig.5 Threshold Voltage V.S Junction Temperature

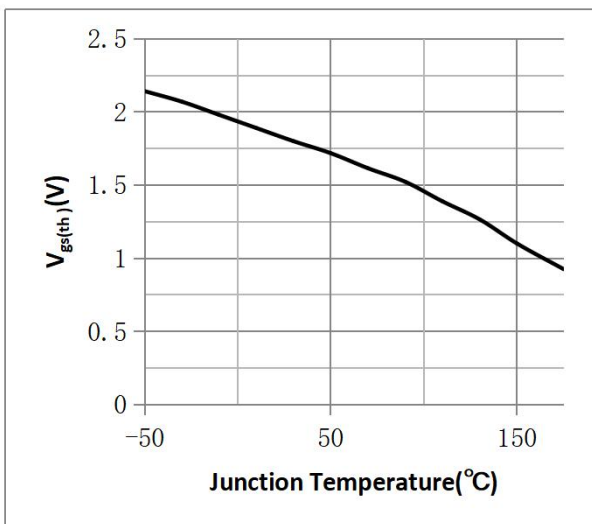


Fig.6 Resistance V.S Drain Current

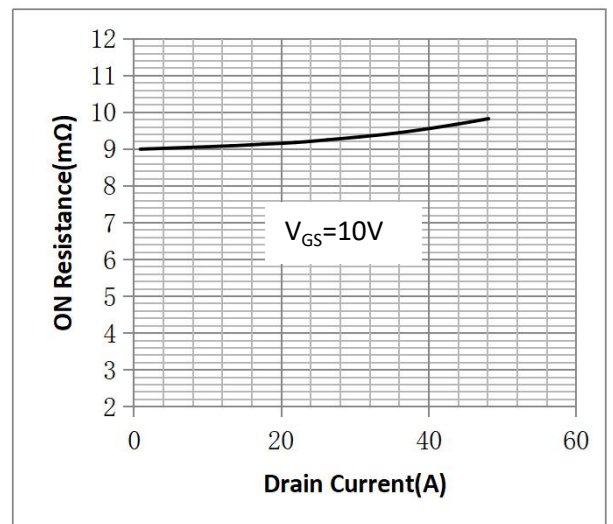


Fig.7 On-Resistance VS Gate Source Voltage

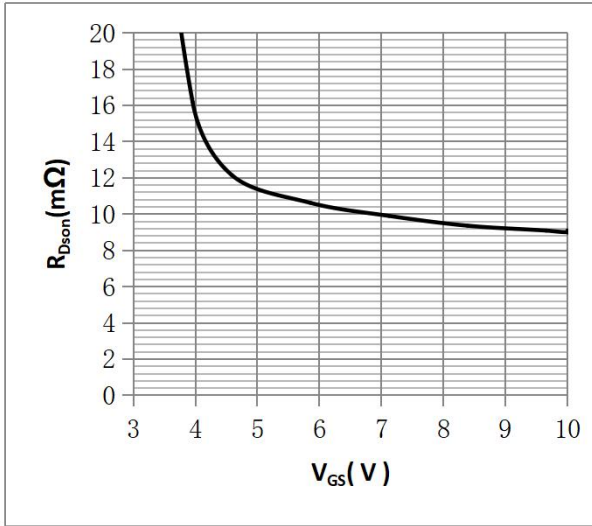


Fig.8 On-Resistance V.S Junction Temperature

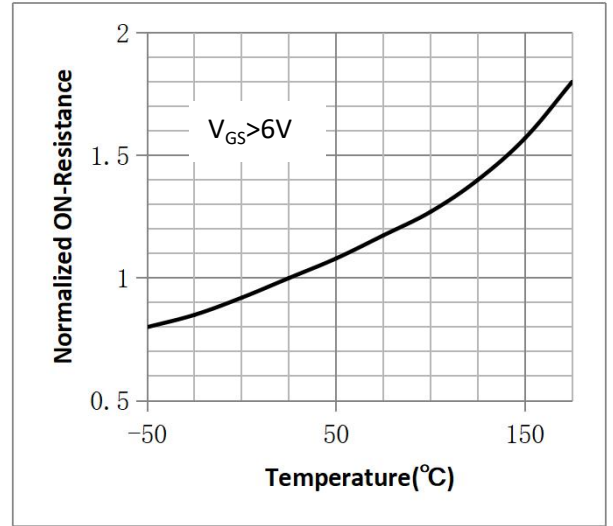


Figure 9. Diode Forward Voltage vs. Current

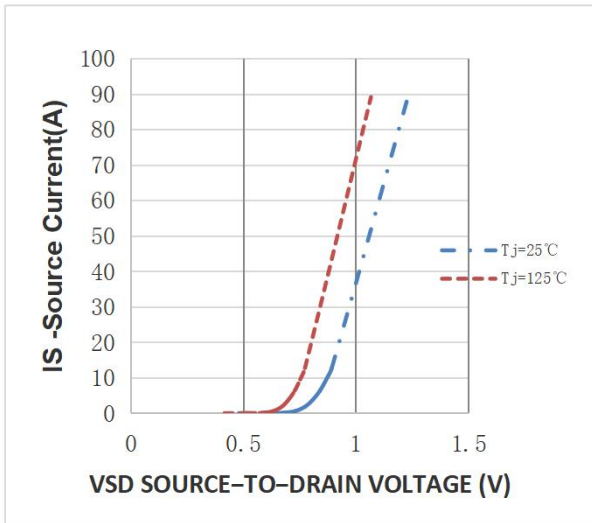


Figure 10. Transfer Characteristics

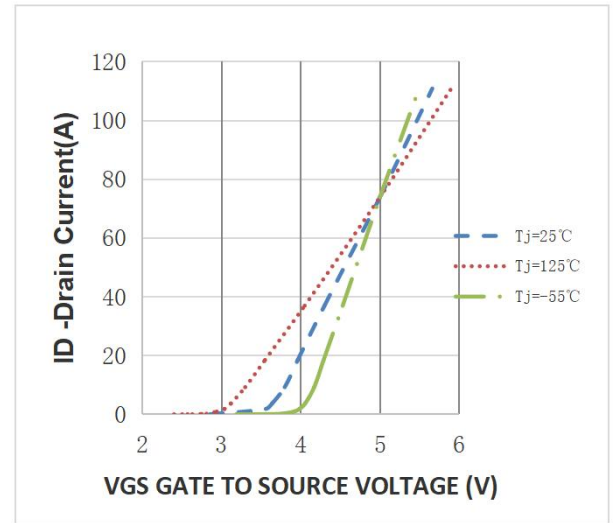


Fig.11 Safe Operating Area

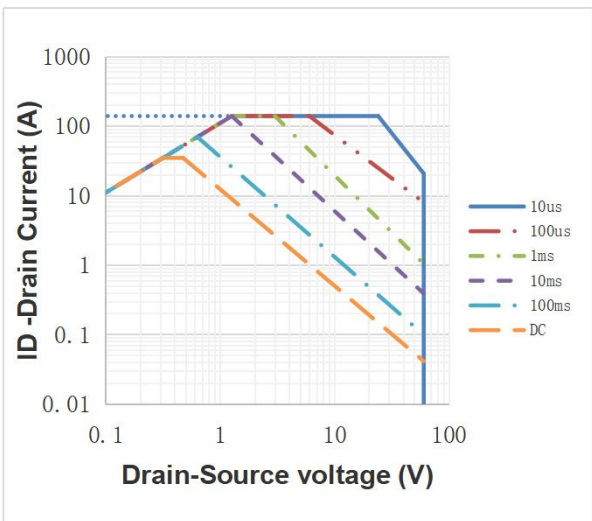
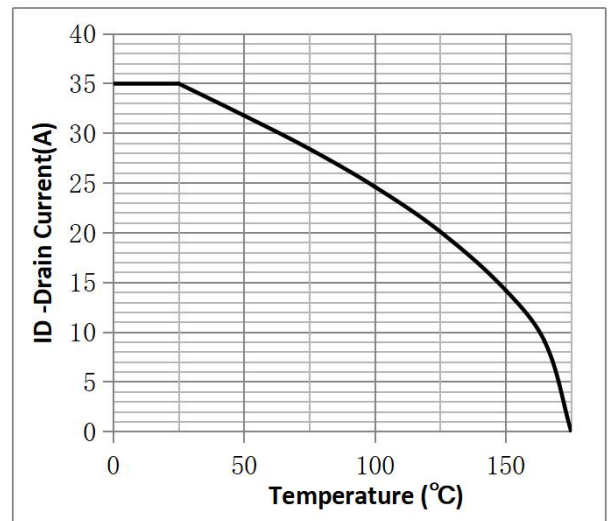
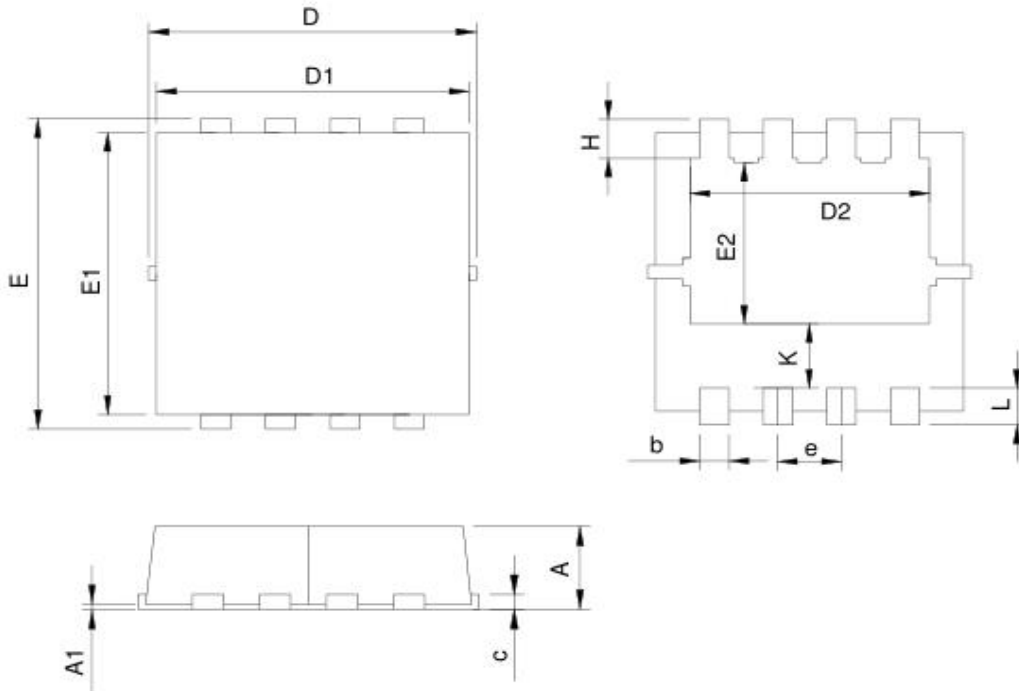


Fig.12 ID vs. Case Temperature<sup>③</sup>

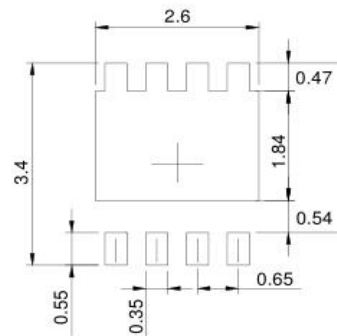


•DFN3\*3 Package Outline



DIMENSIONS	DFN3.3x3.3-8			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	0.70	1.00	0.028	0.039
A1	0.00	0.05	0.000	0.002
b	0.25	0.35	0.010	0.014
c	0.14	0.20	0.006	0.008
D	3.10	3.50	0.122	0.138
D1	3.05	3.25	0.120	0.128
D2	2.35	2.55	0.093	0.100
E	3.10	3.50	0.122	0.138
E1	2.90	3.10	0.114	0.122
E2	1.64	1.84	0.065	0.072
e	0.65 BSC		0.026 BSC	
H	0.32	0.52	0.013	0.020
K	0.59	0.79	0.023	0.031
L	0.25	0.55	0.010	0.022

RECOMMENDED LAND PATTERN



UNIT: mm

**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	2021.9.10	
B	2022.1.7	1.Add Reach,HF figure
C	2023.9.26	1.Change the maximum value of Rdson at 4.5V to 17mΩ
D	2023.12.4	Correct marking and ID curve