

General Description

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

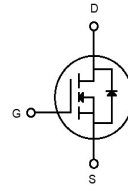
Features

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

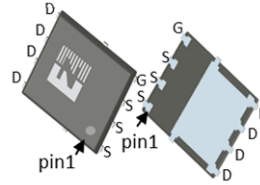
Application

- BLDC Motor driver
- DC-DC
- Load Switch

Product Summary



$V_{DS} = 60V$
 $R_{DS(ON)} = 0.75m\Omega$
 $I_D = 384A$



DFN5*6



Ordering Information:

Part NO.	ZMSA009N06NC
Marking	ZMS009N06
Packing Information	REEL TAPE
Basic ordering unit (pcs)	3000

Absolute Maximum Ratings ($T_A=25^\circ C$, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Max.	Unit
Drain-Source Voltage	V_{DS}		-	60	V
Gate-Source Voltage ^①	V_{GS}		-20	20	V
Continuous Drain Current	I_D	$V_{GS}=10V, T_C=25^\circ C$	-	384	A
	I_D	$V_{GS}=10V, T_C=75^\circ C$	-	313	A
	I_D	$V_{GS}=10V, T_C=100^\circ C$	-	271	A
Pulsed Drain Current ^①	I_{DM}	Pulsed; $t_p \leq 10 \mu s$; $T_C = 25^\circ C$;	-	1536	A
Total Power Dissipation	P_D	$T_C=25^\circ C$	-	224	W
Total Power Dissipation	P_D	$T_A=25^\circ C$	-	3.3	W
Operating Junction Temperature	T_J		-55	175	$^\circ C$
Storage Temperature	T_{STG}		-55	175	$^\circ C$
Single Pulse Avalanche Energy	E_{AS}	$L=0.1mH, V_{GS}=10V, R_g=25\Omega$,	-	605	mJ
		$L=0.3mH, V_{GS}=10V, R_g=25\Omega$,	-	968	mJ
ESD Level (HBM)	CLASS 2				

•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}	-	-	0.67	°C/W
Thermal resistance, junction-ambient	$R_{thJA}^{②}$	-	-	45	°C/W
Soldering temperature	T_{sold}	-	-	260	°C

•Electronic Characteristics (Tj=25°C,unless otherwise specified)

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	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=250\mu A, T_j=25^\circ C$	1.2	1.6	2.5	V
Drain-Source Leakage Current	I_{DSS}	$V_{GS}=0V, V_{DS}=60V, T_j=25^\circ C$	-	-	1	μA
Gate- Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=40A, T_j=25^\circ C$	-	0.75	0.9	m Ω
		$V_{GS}=10V, I_D=40A, T_j=175^\circ C$	-	1.3	-	m Ω
		$V_{GS}=4.5V, I_D=32A, T_j=25^\circ C$	-	1.2	1.5	m Ω
		$V_{GS}=4.5V, I_D=32A, T_j=175^\circ C$	-	2.0	-	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_{SD}=10A$	-	53	-	S
Diode Forward Voltage	V_{FSD}	$V_{GS}=0V, I_{SD}=40A$	-	-	1.3	V

•Dynamic characteristics (Tj=25°C,unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	C_{iss}	$f=1MHz, V_{DS}=30V, V_{GS}=0V$	-	6933	-	pF
Output capacitance	C_{oss}		-	2263	-	
Reverse transfer capacitance	C_{rss}		-	179	-	
Gate Resistance	R_g	$f=1MHz$	-	1.1	-	Ω
Total gate charge	Q_g	$V_{DD}=30V, I_D=40A, V_{GS}=10V$	-	152	-	nC
Gate - Source charge	Q_{gs}		-	17	-	
Gate - Drain charge	Q_{gd}		-	43	-	
Turn-ON Delay time	$t_{D(on)}$	$V_{GS}=10V, V_{DS}=30V, R_G=3.3\Omega, I_D=40A$	-	18	-	ns
Turn-ON Rise time	t_r		-	95	-	ns
Turn-Off Delay time	$t_{D(off)}$		-	102	-	ns
Turn-Off Fall time	t_f		-	131	-	ns
Reverse Recovery Time	t_{rr}	$V_{DD}=40V, dI_S/dt=100A/\mu s, I_S=40A$	-	64	-	ns
Reverse Recovery Charge	Q_{rr}		-	85	-	nC

Fig.1 Gate-source voltage as a function of gate charge; Typical values; $T_j=25^\circ\text{C}$

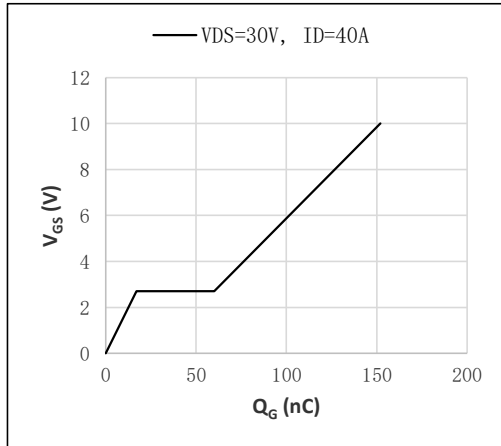


Fig.2 Input, output and reverse transfer capacitances as a function of drain-source voltage; Typical values; $T_j=25^\circ\text{C}$

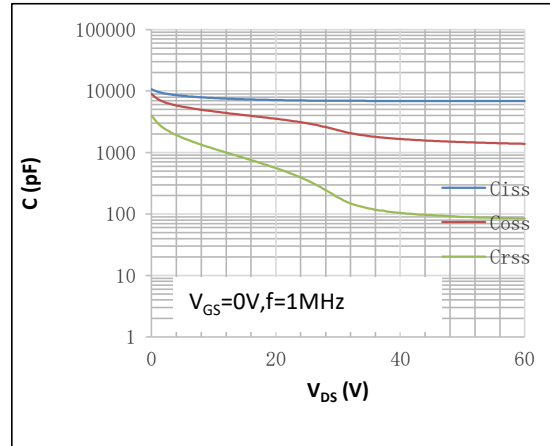


Fig.3 Output characteristics: drain current as a function of drain-source voltage; Typical values; $T_j=25^\circ\text{C}$

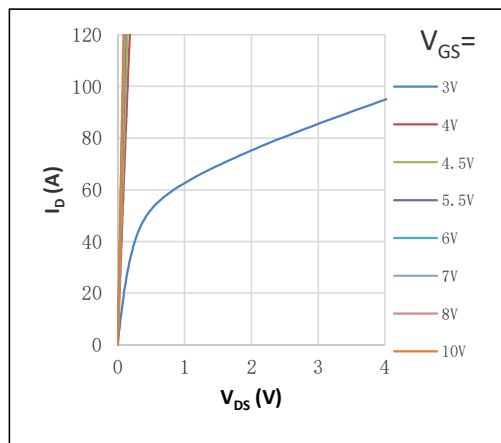


Fig.4 Output characteristics: drain current as a function of drain-source voltage; Typical values: Expanded curve; $T_j=25^\circ\text{C}$

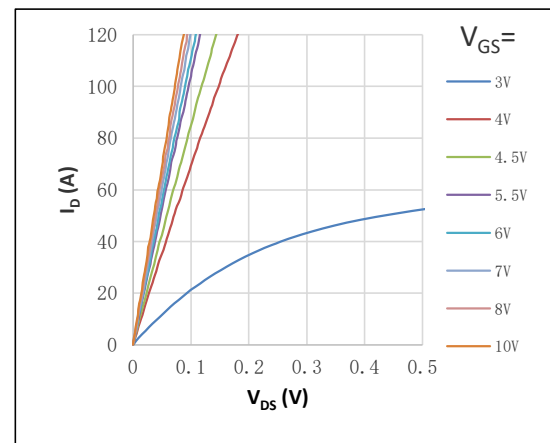


Fig.5 Gate-source threshold voltage as a function of junction temperature; Typical values

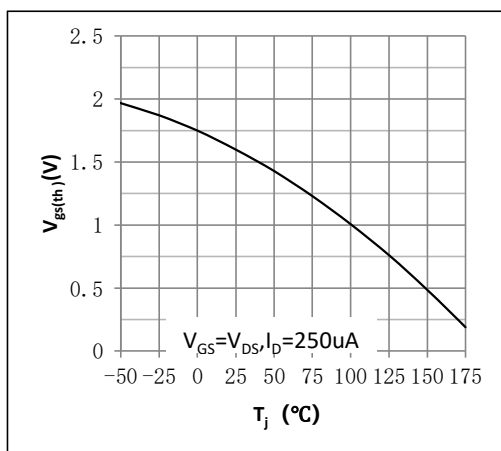


Fig.6 Drain-source on-state resistance as a function of drain current; Typical values; $T_j=25^\circ\text{C}$

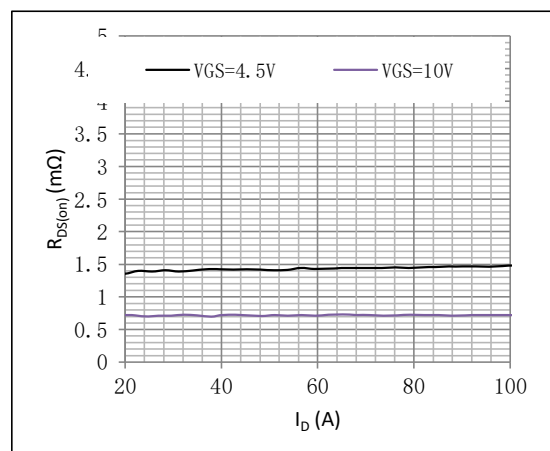


Fig.7 Drain-source on-state resistance as a function of gate-source voltage;Typical values

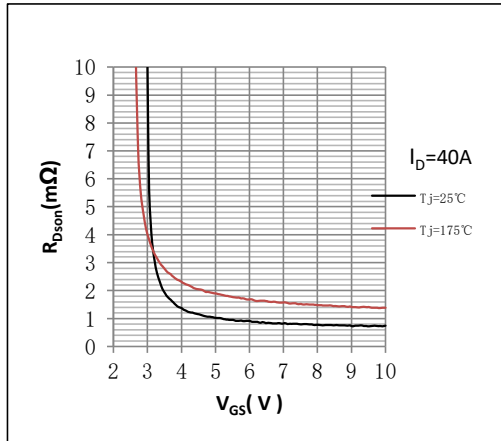


Fig.8 Normalized drain-source on-state resistance factor as a function of junction temperature;Typical values
Normalized On-Resistance= $R_{DS(on)}/R_{DS(on)}(25^{\circ}\text{C})$

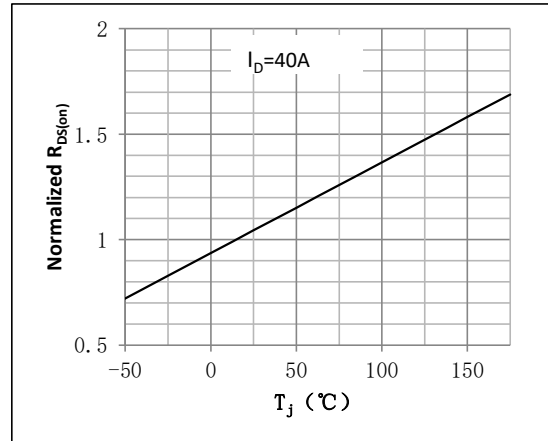


Figure 9. Source (diode forward) current as a function of source-drain (diode forward) voltage ;Typical values

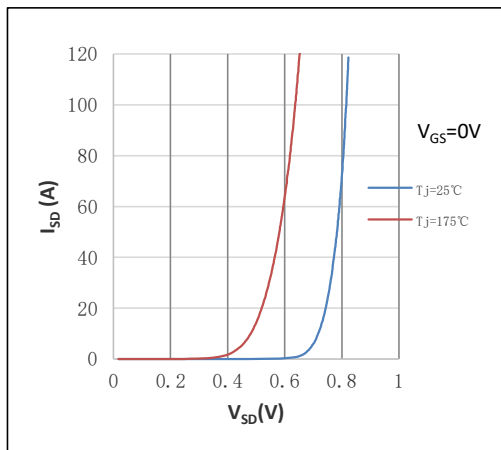


Figure 10. Transfer characteristics: drain current as a function of gate-source voltage;Typical values

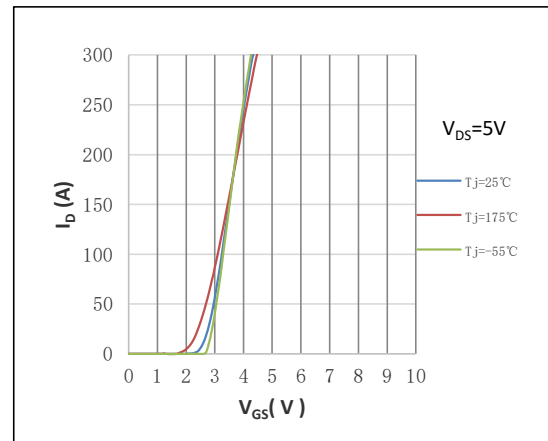


Fig.11 Safe operating area: continuous and peak drain currents as a function of drain-source voltage;Calculative values

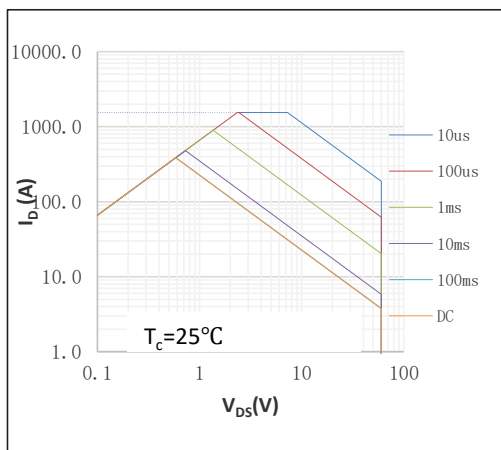


Fig.12 Continuous drain current as a function of case temperature[®];Calculative values

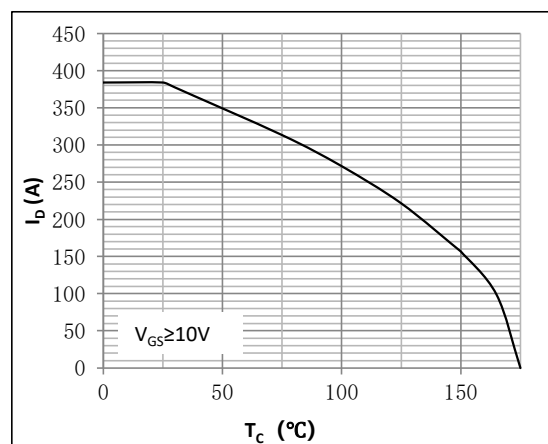


Fig.13 Drain-source breakdown voltage as a function of junction temperature; Typical values
Normalized BVDSS=BVDSS/BVDSS(25°C)

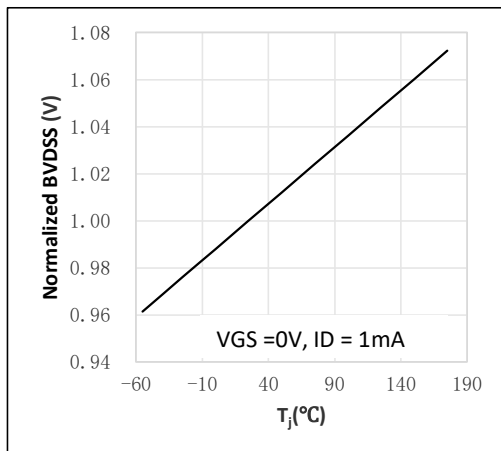


Fig.14 Normalized total power dissipation as a function of case temperature; Calculative values
Normalized Power Dissipation= $P_d/P_d(25^\circ C)$

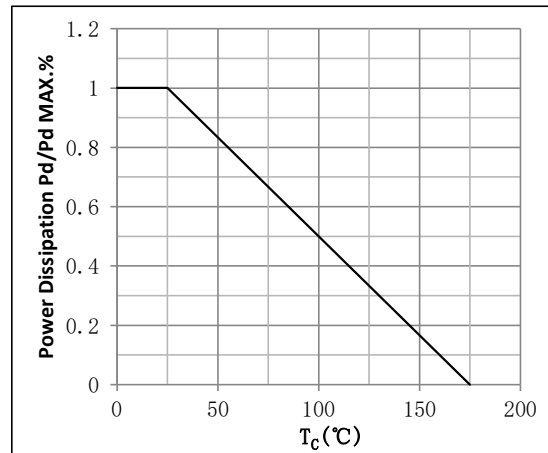
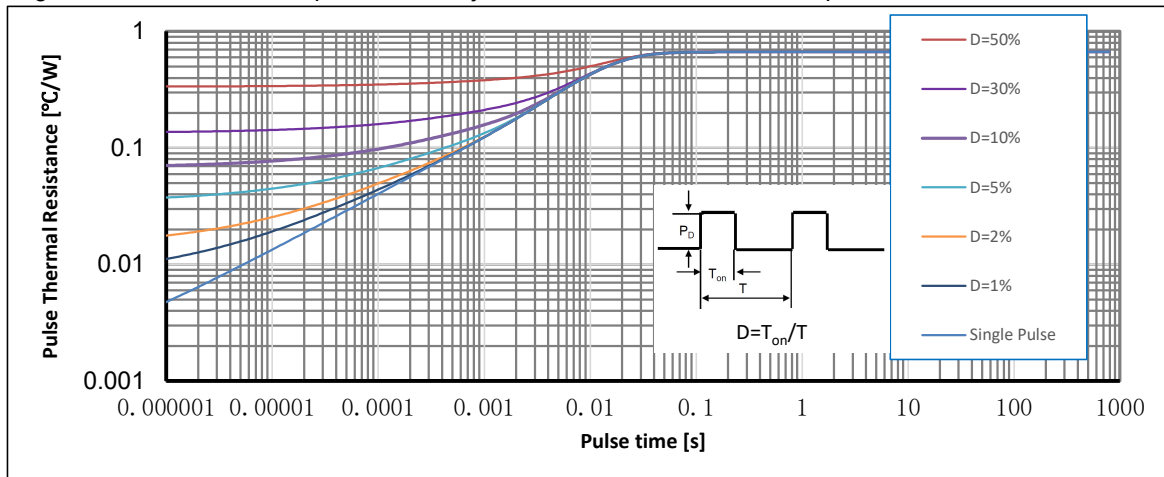
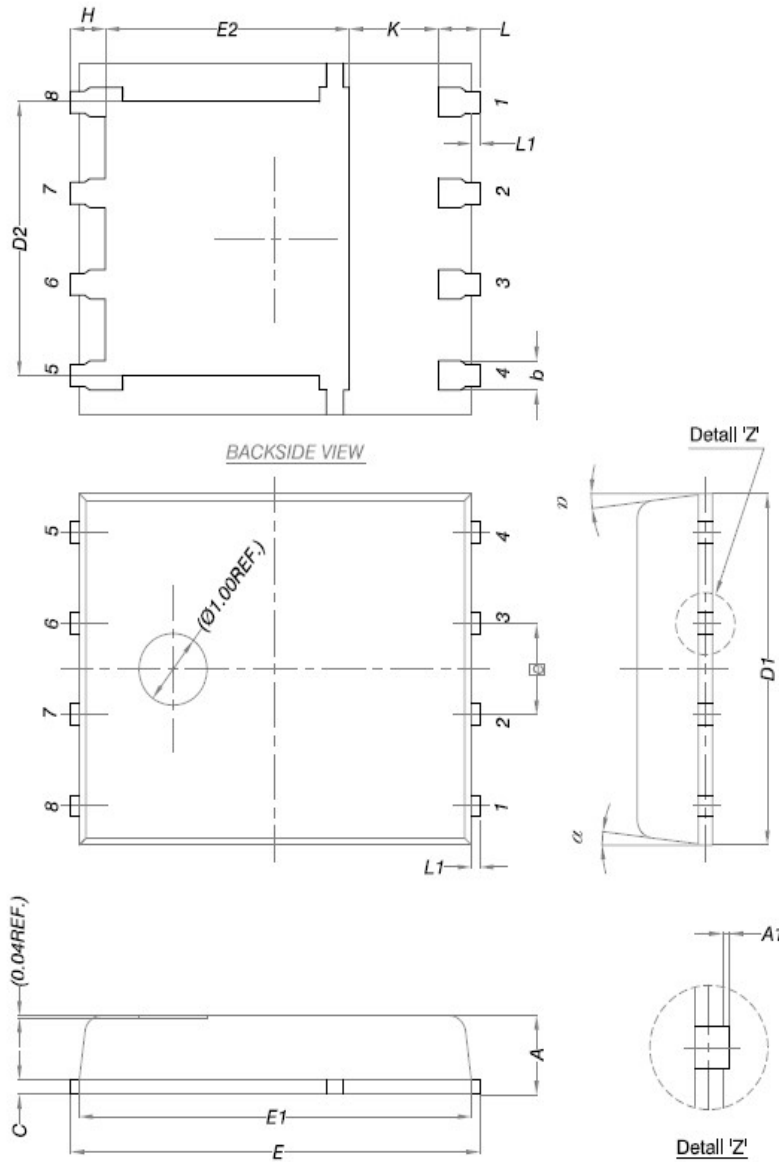


Fig.15 Transient thermal impedance from junction to case as a function of pulse duration; max values



•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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Version	Date	Change
A	2024/11/12	New