40V N-Channel Power SpeedFET

• 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

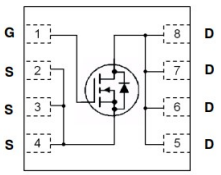
•Application

■BLDC Motor driver

■DC-DC

■Load Switch

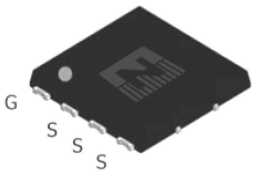
• Product Summary



V_{DS}= 40V

$R_{DS(ON)}$ = 0.4mΩ

I_D= 475A



DFN8*8

RoHS

REACH COMPLIANT

HF

•Ordering Information:

Part NO.	ZMSA004N04HG
Marking	ZMS004N04H
Packing Information	REEL TAPE
Basic ordering unit (pcs)	2500

•Absolute Maximum Ratings (T_C=25℃)

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DS}		40	V
Gate-Source Voltage①	V_{GS}		±20	V
Continuous Drain Current	I_D	T_C=25℃	475	A
	I_D	T_C=75℃	452	A
	I_D	T_C=100℃	391	A
Pulsed Drain Current	I_{DM}	Pulsed; t_p ≤ 10 μs; T_{mb} = 25 °C;	1425	A
Total Power Dissipation	P_D	T_C=25℃	250	W
Total Power Dissipation	P_D	T_A=25℃	4.3	W
Operating Junction Temperature	T_J		-55 to +175	℃
Storage Temperature	T_{STG}		-55 to +175	℃
Single Pulse Avalanche Energy	E_{AS}	L=0.1mH, V_{GS}=10V, Rg=25Ω,	560	mJ
		L=0.5mH, V_{GS}=10V, Rg=25Ω,	1176	mJ
ESD Level (HBM)	CLASS 2			

●Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}		-	0.6	°C/W
Thermal resistance, junction-ambient	R_{thJA} ②		-	35	°C/W
Soldering temperature	Tsold		-	260	°C

●Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS} =0V, I_D =250uA	40			V
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} =V_{DS}, I_D =250uA	2.0	2.7	4.0	V
Drain-Source Leakage Current	I_{DSS}	V_{GS}=0V, V_{DS}= 40V			1.0	uA
Gate- Source Leakage Current	I_{GSS}	V_{GS}=±20V, V_{DS} = 0V			100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D= 40A		0.4	0.48	mΩ
Forward Transconductance	g_{FS}	V_{GS} =5V, I_{SD} = 20A		60		s
Diode Forward Voltage	V_{FSD}	V_{GS} =0V, I_{SD} = 40A			1.3	V
		V_{DS} =5V, I_{SD} =				

●Dynamic characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	Ciss	f = 1MHz, V_{DS}=25V	-	10860	-	pF
Output capacitance	Coss		-	3040	-	
Reverse transfer capacitance	Crss		-	168	-	
Gate Risistance	Rg	f = 1MHz	-	3.2		Ω
Total gate charge	Qg	V_{DD} = 15V, I_D = 20A, V_{GS} = 10V	-	174	-	nC
Gate - Source charge	Qgs		-	42	-	
Gate - Drain charge	Qgd		-	38	-	
Turn-ON Delay time	$t_{D(on)}$	V_{GS}=10V,V_{DS}=15V, R_G =3.3Ω, I_D =20A	-	75	-	ns
Turn-ON Rise time	t_r		-	78	-	ns
Turn-Off Delay time	$t_{D(off)}$		-	120	-	ns
Turn-Off Fall time	t_f		-	55	-	ns
Reverse Recovery Time	t_{RR}	V_{DD}=20V, dI_S/dt = 100A/us, I_S=50A	-	96	-	ns
Reverse Recovery Charge	Q_{RR}		-	230	-	nC

Fig.1 Gate-Charge Characteristics

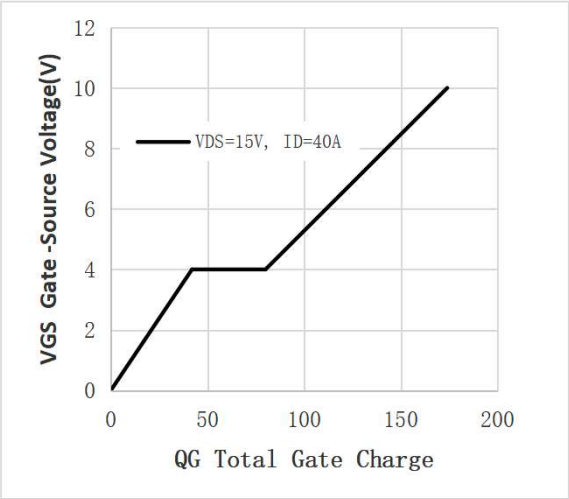


Fig.2 Capacitance Characteristics

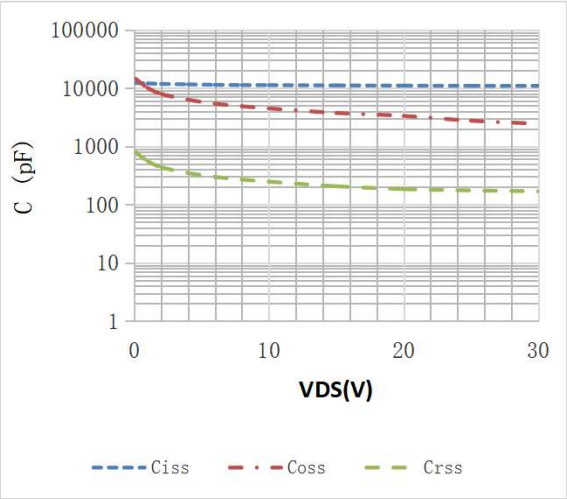


Fig.3 Power Dissipation

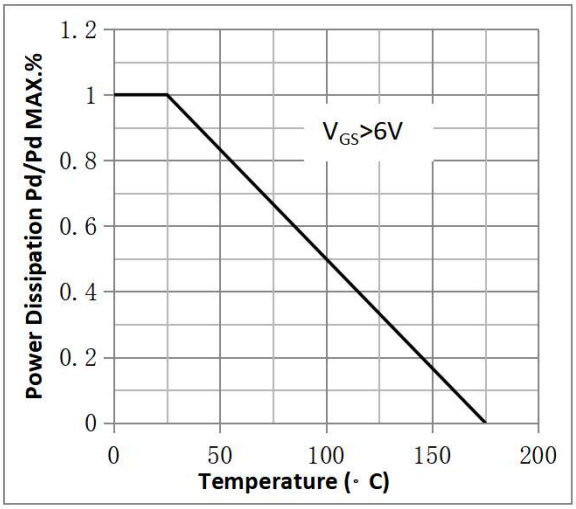


Fig.4 Typical output Characteristics

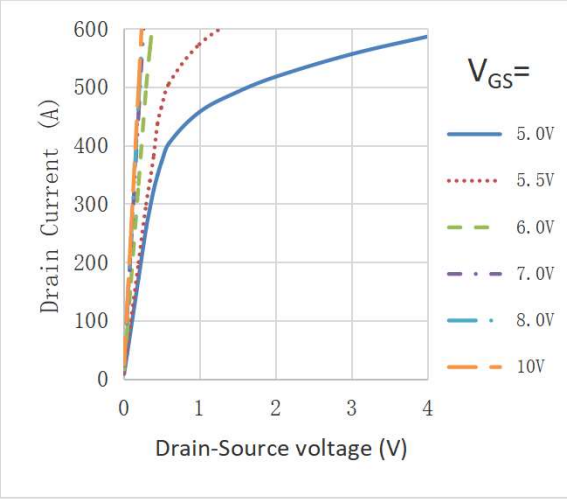


Fig.5 Threshold Voltage V.S Junction Temperature

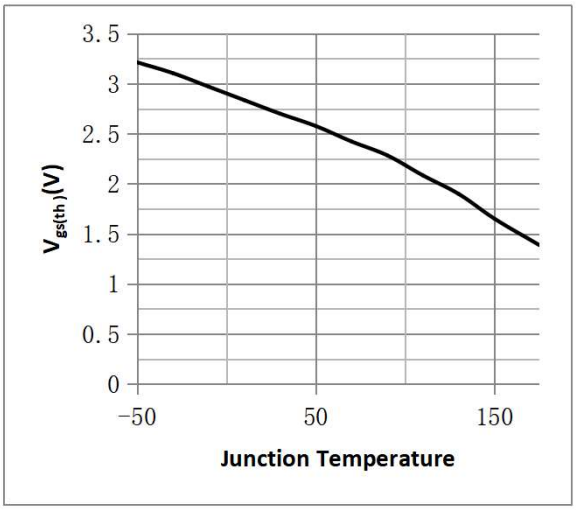


Fig.6 Resistance V.S Drain Current

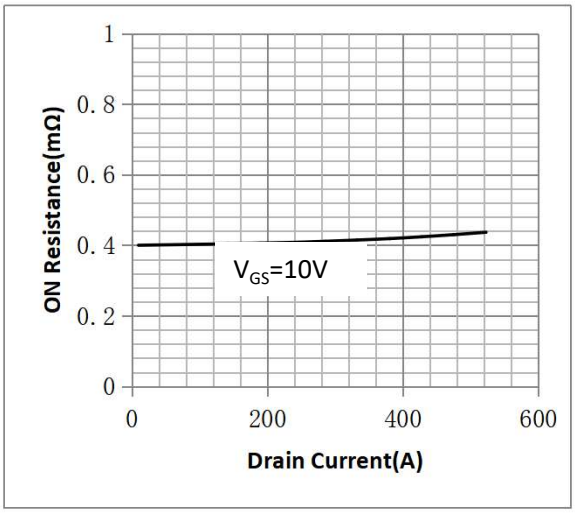


Fig.7 On-Resistance VS Gate Source Voltage

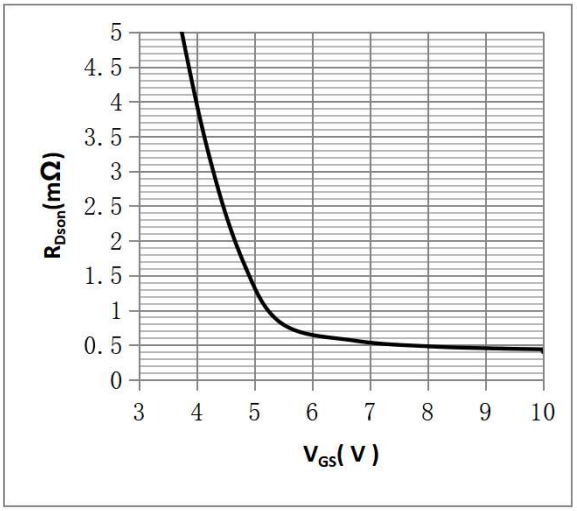


Fig.8 On-Resistance V.S Junction Temperature

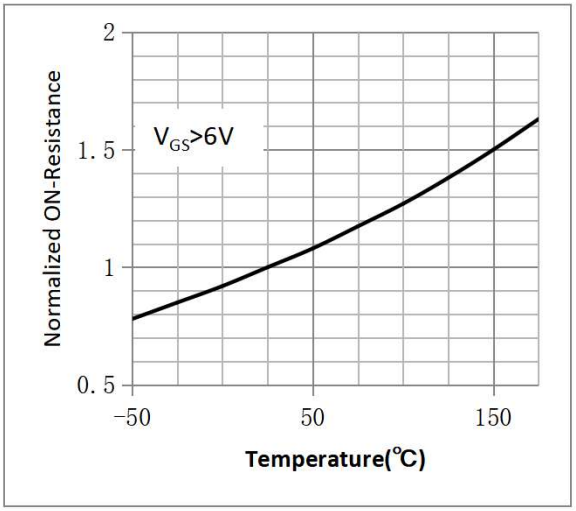


Figure 9. Diode Forward Voltage vs. Current

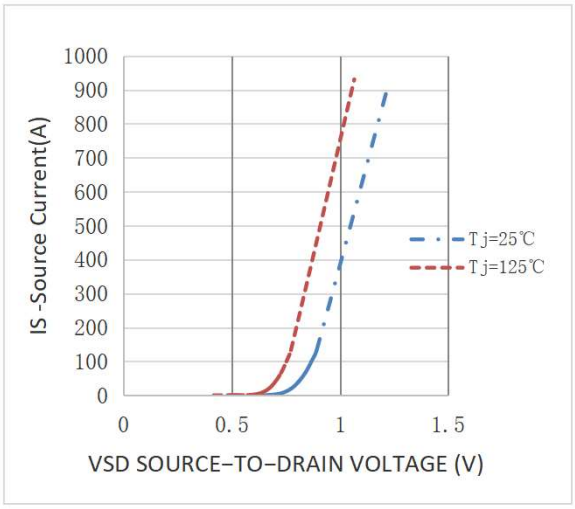


Figure 10. Transfer Characteristics

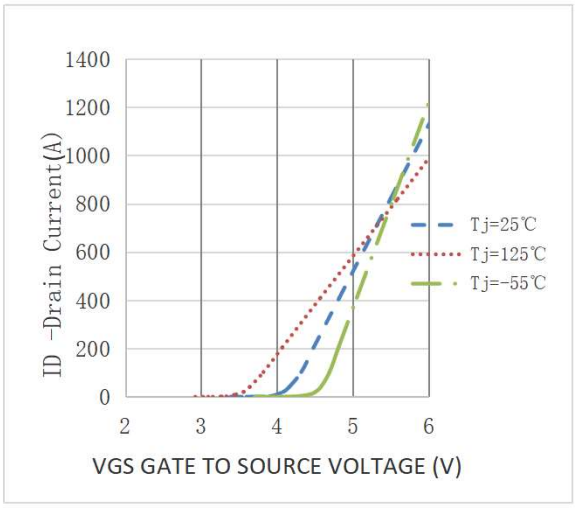


Fig.11 Safe Operating Area

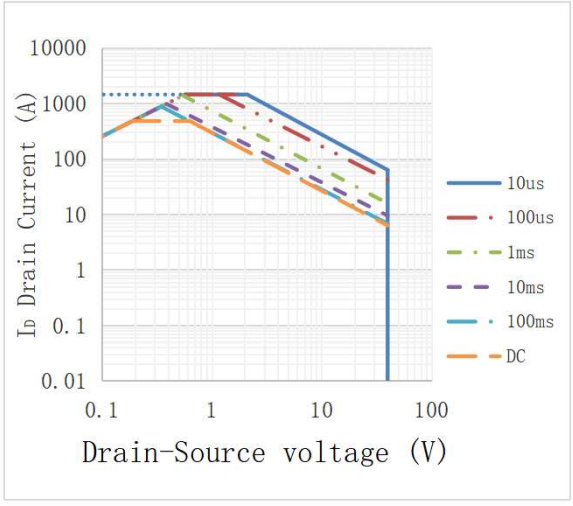
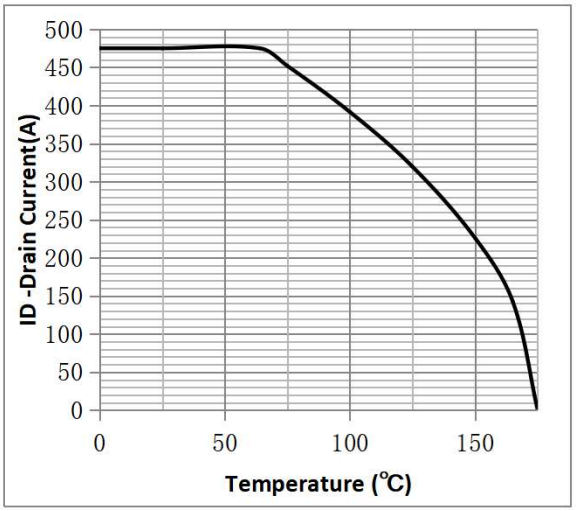
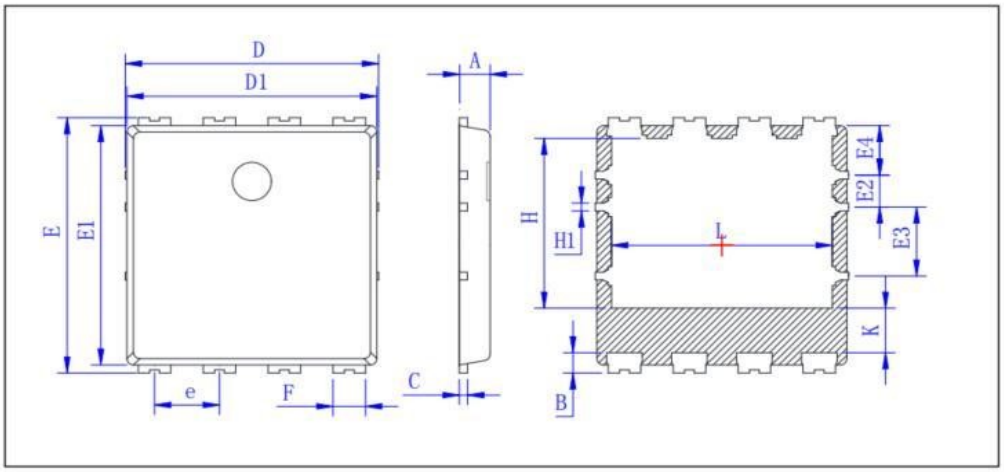


Fig.12 ID vs. Case Temperature③



●DFN8*8 Package Outline



Symbol	Min	Typ	Max
A	0.90	0.95	1.00
B	0.50	0.60	0.70
C		0.254 TYP	
D	7.70	7.80	7.90
D1	7.60	7.70	7.80
E	7.90	8.00	8.10
E1	7.40	7.50	7.60
E2	0.90	1.00	1.10
E3	2.06	2.16	2.26
E4	1.45	1.55	1.65
e		2.0 TYP	
F		1.00 TYP	
H	5.15	5.30	5.40
H1	0.20	0.25	0.35
L	6.60	6.80	6.90
K	1.20		

Note:

① Pulse : VGS=+20V/-20V, Duty cycle=50%,Tj=175℃, t=1000 hours; For DC， the following test conditions can be passed: VGS=+20V/-10V, Tj=175℃, t=1000 hours；

② Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate；

③Practically 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	2022.11.6	New
B	2022.12.8	1.ID and ID curve Modified
C	2023.12.18	Corect SOA Curve
D	2024.11.6	RDSon modified.