40V N-Channel Power SpeedFET

● General Description

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

● Features

■AEC-Q101 Qualified

■Low $R_{DS(ON)}$ to minimize conductive loss

■Low Gate Charge for fast switching

■Low Thermal resistance

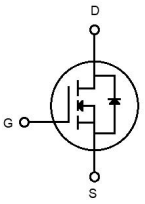
●Application

■BLDC Motor driver

■DC-DC

■Battery protection

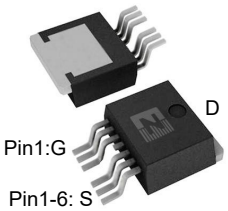
● Product Summary



V_{DS}= 40V

$R_{DS(ON)}$ = 1.1mΩ

I_D= 155A



TO-263-6

RoHS

REACH COMPLIANT

HF

●Ordering Information:

Part NO.	ZMSA011N04HB6
Marking	ZMS011N04H
Packing Information	REEL TAPE
Basic ordering unit (pcs)	800

●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℃	155	A
	I_D	T_C=75℃	155	A
	I_D	T_C=100℃	153	A
Pulsed Drain Current	I_{DM}	Pulsed; t_p ≤ 10 μs; T_{mb} = 25 °C;	465	A
Total Power Dissipation	P_D	T_C=25℃	188	W
Total Power Dissipation	P_D	T_A=25℃	5.0	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,	320	mJ
		L=0.5mH, V_{GS}=10V, Rg=25Ω,	460	mJ
ESD Level (HBM)	CLASS 2			

●Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}		-	0.8	°C/W
Thermal resistance, junction-ambient②	R_{thJA}		-	30	°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		1.1	1.5	mΩ
Forward Transconductance	g_{FS}	V_{DS} =5V, I_{SD} = 20A		30		s
Diode Forward Voltage	V_{FSD}	V_{GS} =0V, I_{SD} = 40A			1.3	V

●Dynamic characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	Ciss	f = 1MHz, V_{DS}=25V	-	5430	7059	pF
Output capacitance	Coss		-	1520	1976	
Reverse transfer capacitance	Crss		-	84	109	
Gate Risistance	Rg	f = 1MHz	-	1.6	2.9	Ω
Total gate charge	Qg	V_{DD} = 15V, I_D = 20A, V_{GS} = 10V	-	87	122	nC
Gate - Source charge	Qgs		-	21	29	
Gate - Drain charge	Qgd		-	19	27	
Turn-ON Delay time	$t_{D(on)}$	V_{GS}=10V,V_{DS}=15V, R_G =3.3Ω, I_D =20A	-	15	23	ns
Turn-ON Rise time	t_r		-	10	15	ns
Turn-Off Delay time	$t_{D(off)}$		-	26	39	ns
Turn-Off Fall time	t_f		-	17	26	ns
Reverse Recovery Time	t_{RR}	V_{DD}=20V, dI_S/dt = 100A/us, I_S=50A	-	65	85	ns
Reverse Recovery Charge	Q_{RR}		-	95	124	nC

Fig.1 Gate-Charge Characteristics

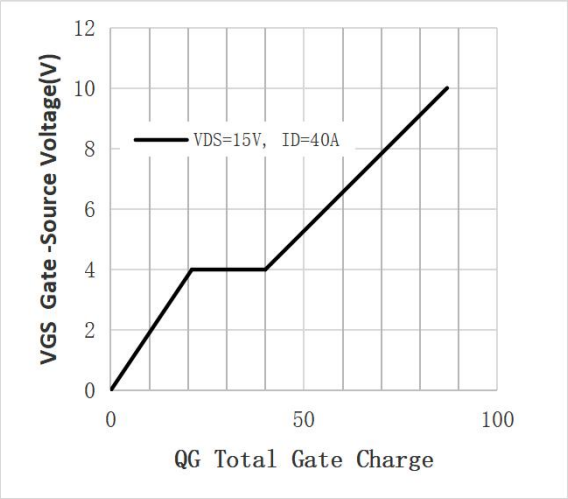


Fig.2 Capacitance Characteristics

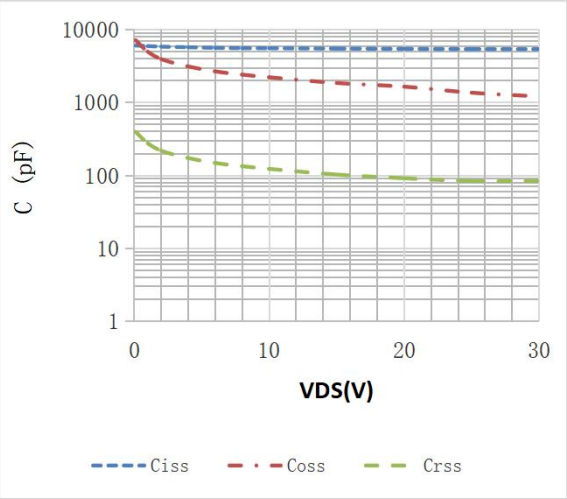


Fig.3 Power Dissipation

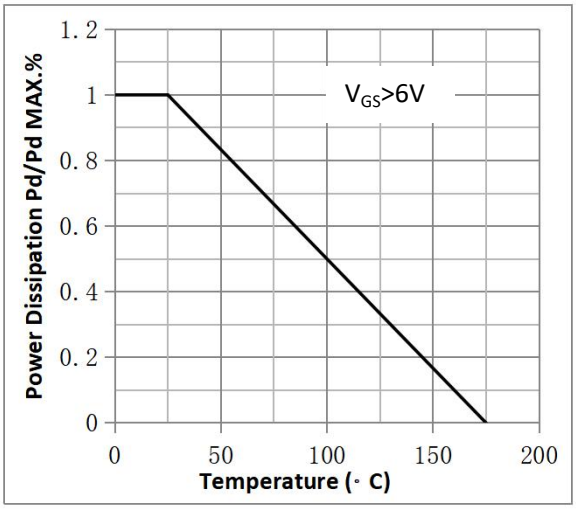


Fig.4 Typical output Characteristics

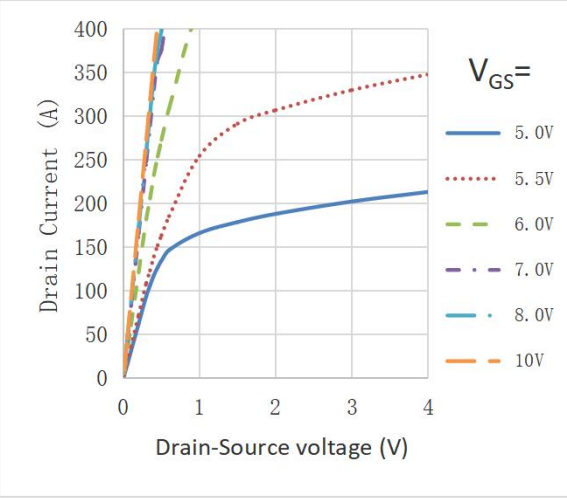


Fig.5 Threshold Voltage V.S Junction Temperature

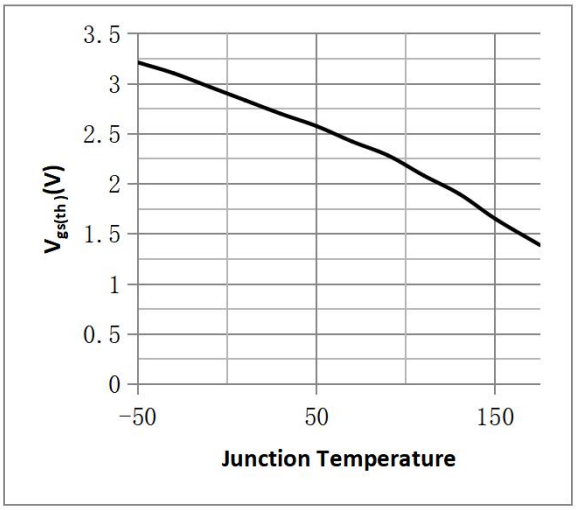


Fig.6 Resistance V.S Drain Current

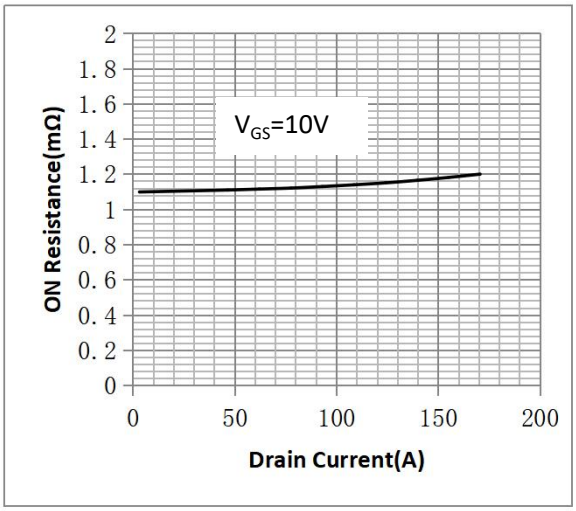


Fig.7 On-Resistance VS Gate Source Voltage

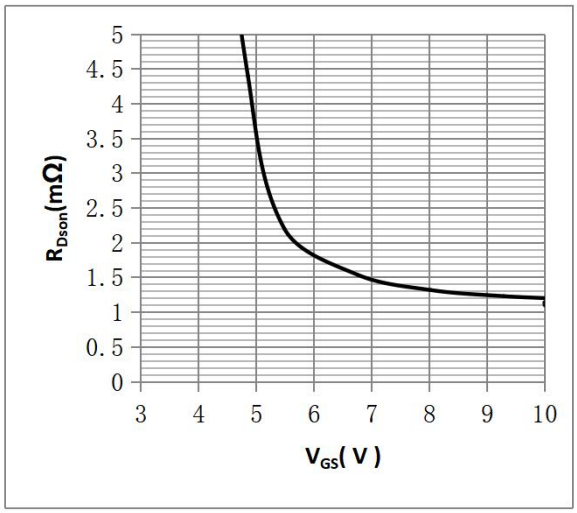


Fig.8 On-Resistance V.S Junction Temperature

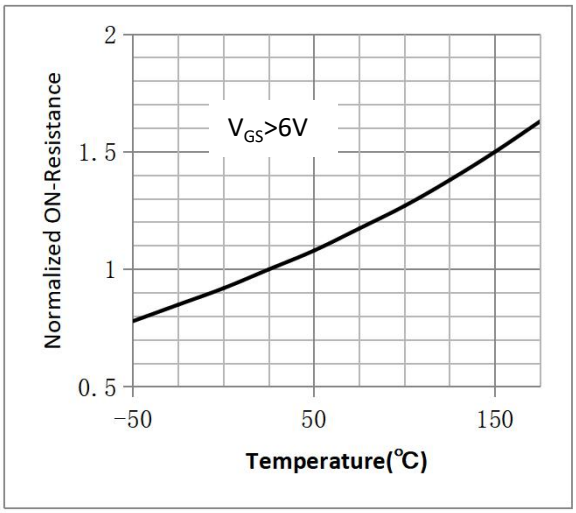


Figure 9. Diode Forward Voltage vs. Current

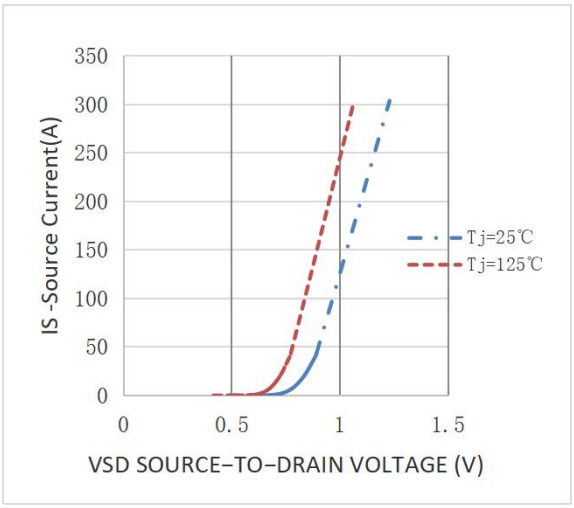


Figure 10. Transfer Characteristics

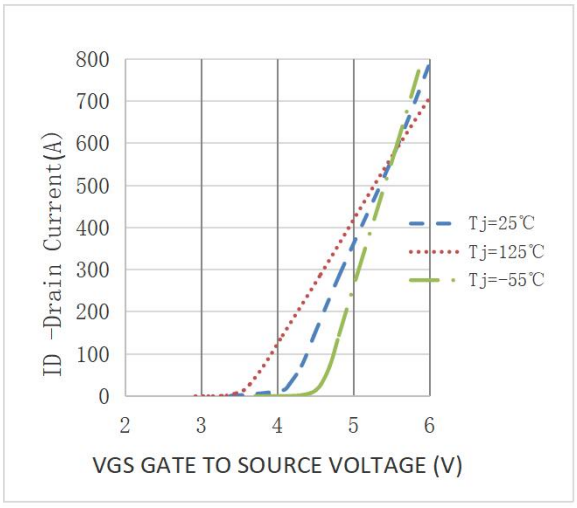


Fig.11 Safe Operating Area

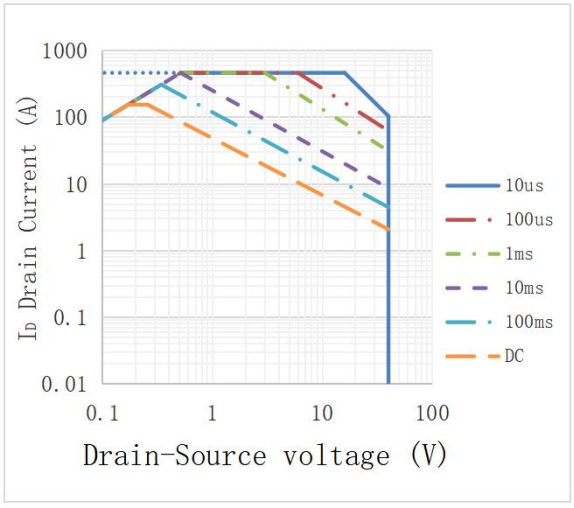
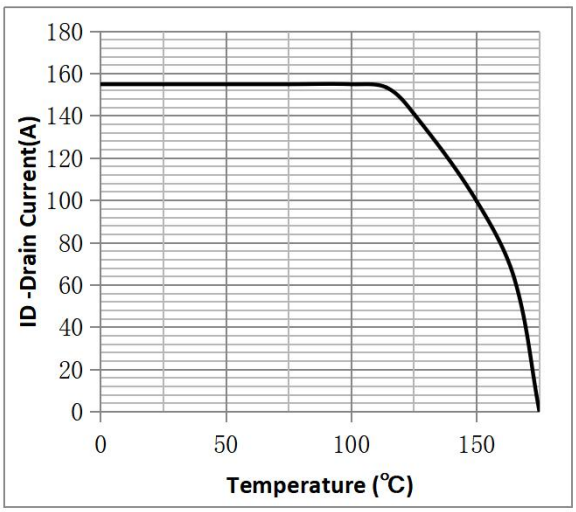
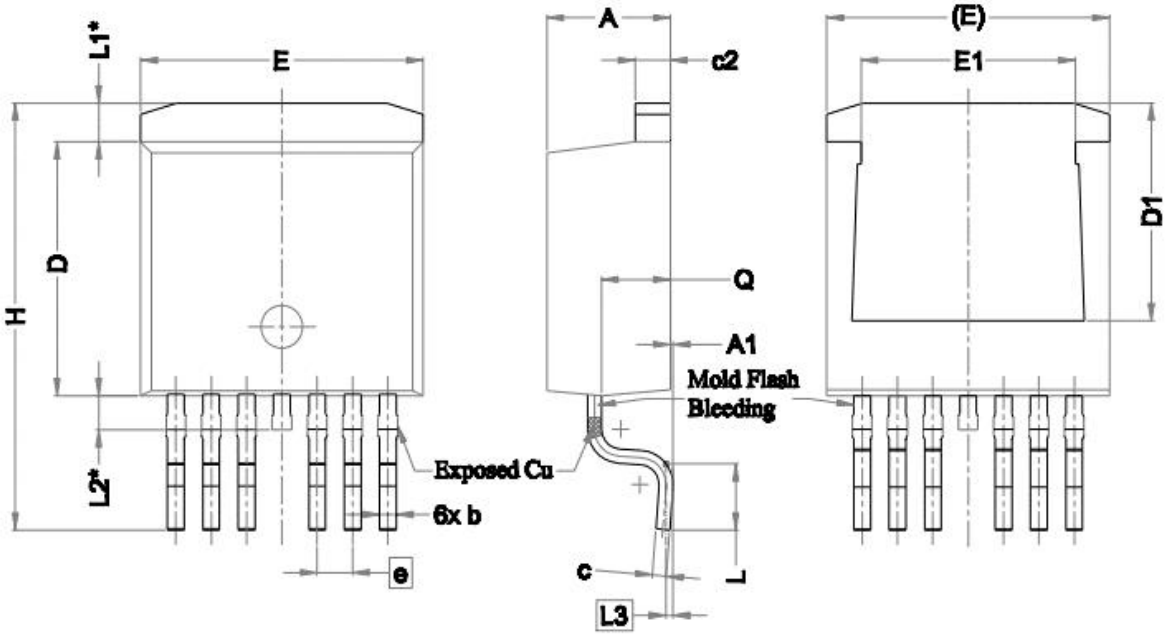


Fig.12 ID vs. Case Temperature③

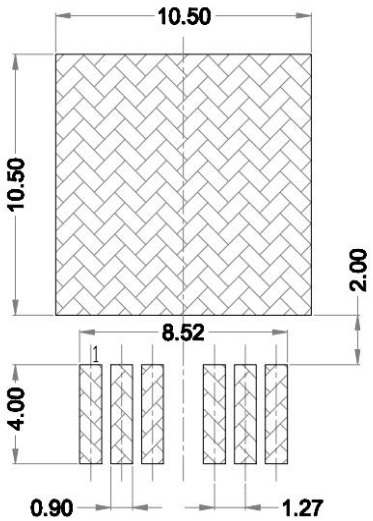


●TO-263-6 Package Outline



SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	4.24	4.44	4.64
A1	0.00	0.10	0.25
b	0.50	0.60	0.70
c	0.40	0.50	0.60
c2	1.15	1.27	1.40
D	8.82	8.92	9.02
D1	6.86	7.65	—
E	9.96	10.16	10.36
E1	6.89	7.77	7.89
e	1.27 BSC		
H	14.61	15.00	15.88
L	1.78	2.32	2.79
L1	1.36 REF.		
L2	1.20 REF.		
L3	0.25 BSC		
Q	2.30	2.48	2.70

Land Pattern
(Only for Reference)



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	2022.6.6	
B	2022.9.5	1.Add Reach,HF figure,2.ID modify
C	2022.11.14	limit 2.Add details of dimension drawing
D	2022.12.20	temperature change to case temperature
E	2023.12.21	Correct POD