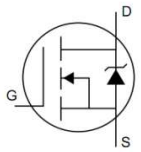
40V N-Channel Power SpeedFET

• 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.

• Product Summary



V_{DS}= 40V

$R_{DS(ON)}$ = 1.4mΩ

I_D= 155A

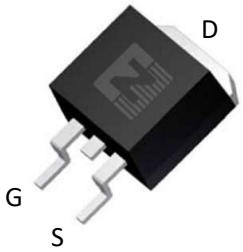
• Features

■AEC-Q101 Qualified

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

■Low Gate Charge for fast switching

■Low Thermal resistance



TO-263

•Application

■BLDC Motor driver

■DC-DC

■Battery protection

•Ordering Information:

Part NO.	ZMSA011N04HB
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℃	155	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		1.4	1.6	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

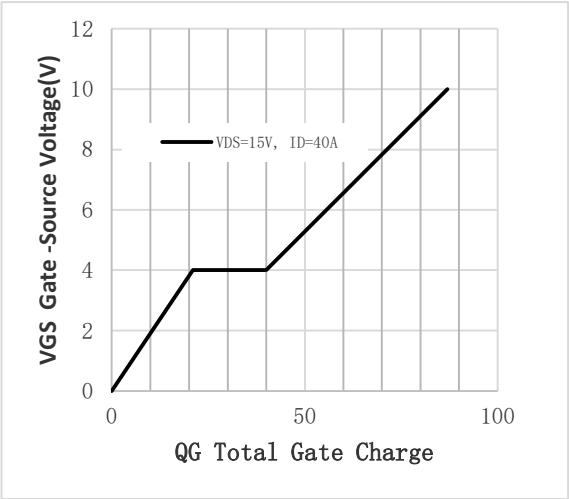


Fig.2 Capacitance Characteristics

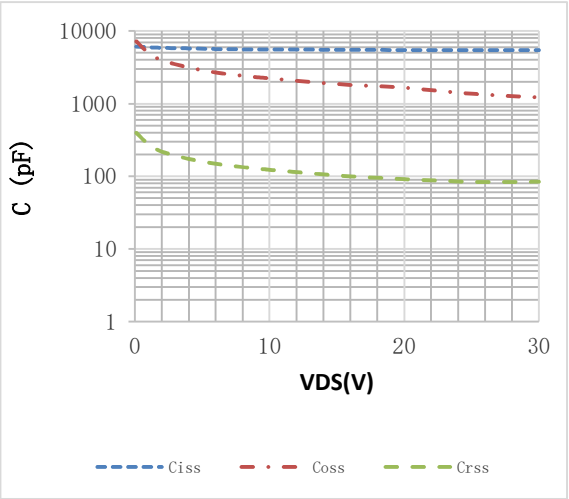


Fig.3 Power Dissipation

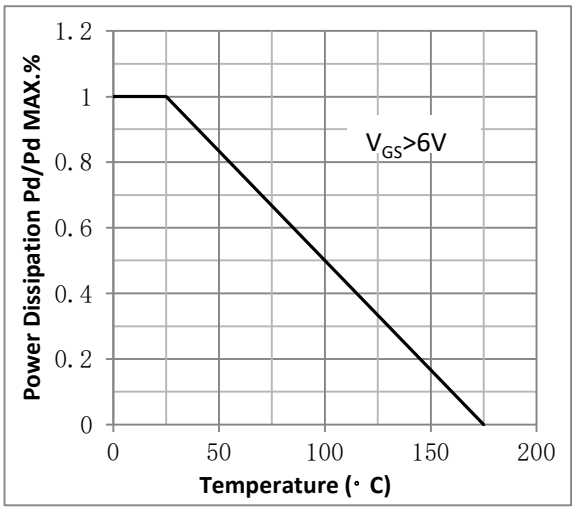


Fig.4 Typical output Characteristics

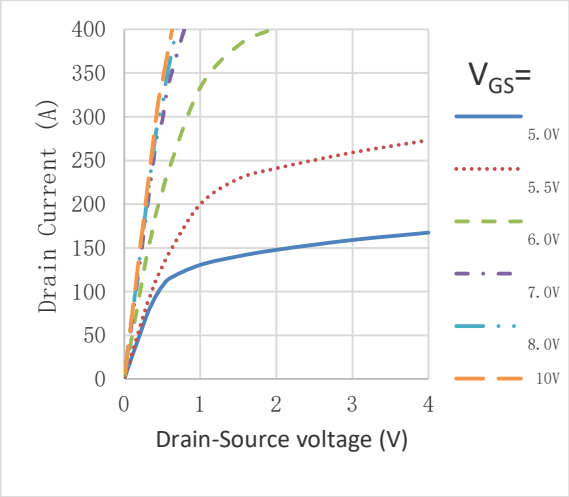


Fig.5 Threshold Voltage V.S Junction Temperature

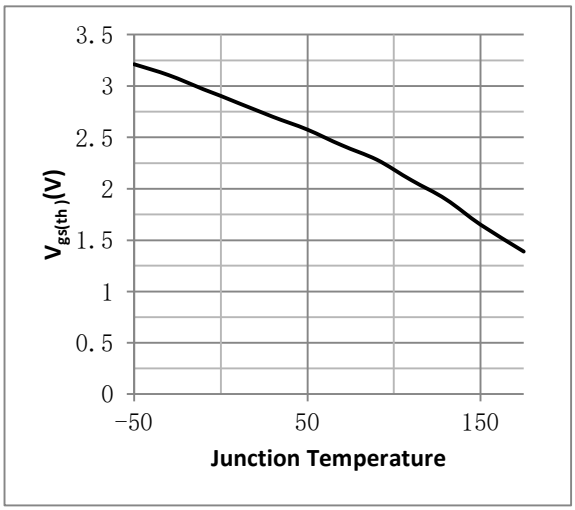


Fig.6 Resistance V.S Drain Current

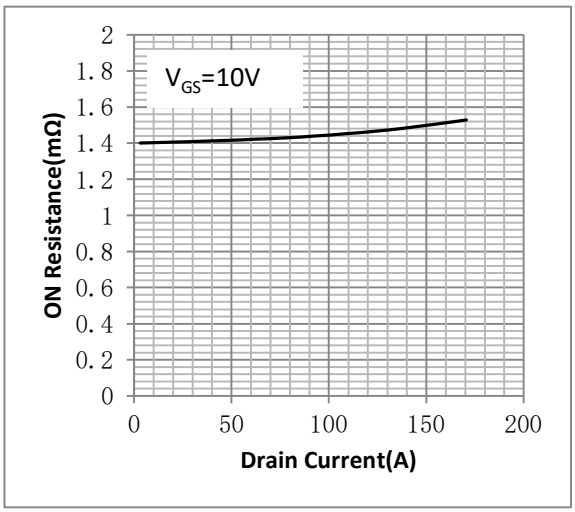


Fig.7 On-Resistance VS Gate Source Voltage

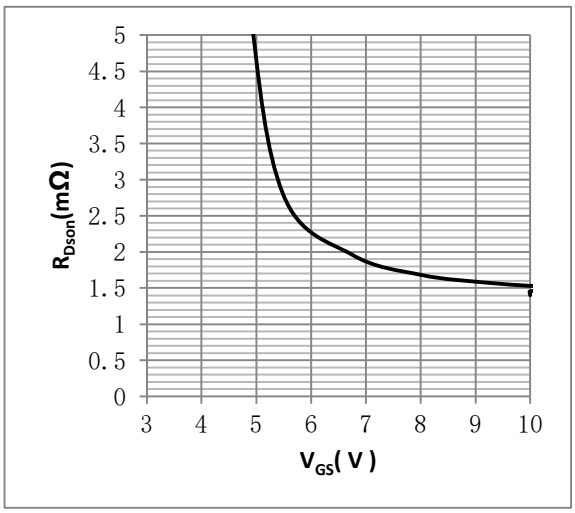


Fig.8 On-Resistance V.S Junction Temperature

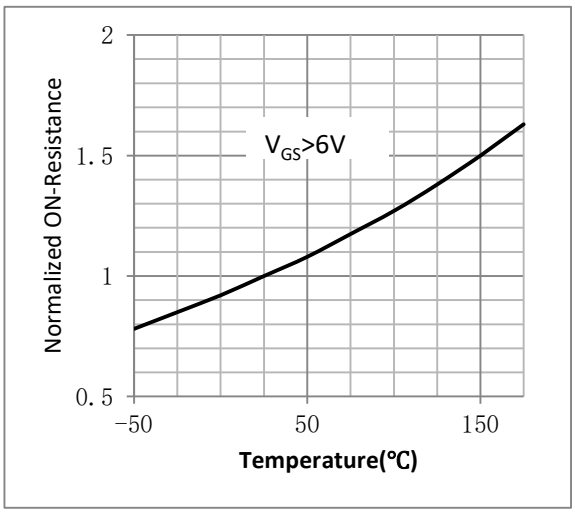


Figure 9. Diode Forward Voltage vs. Current

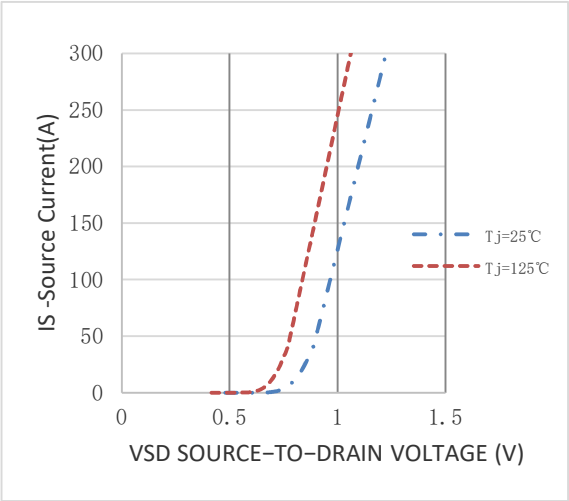


Figure 10. Transfer Characteristics

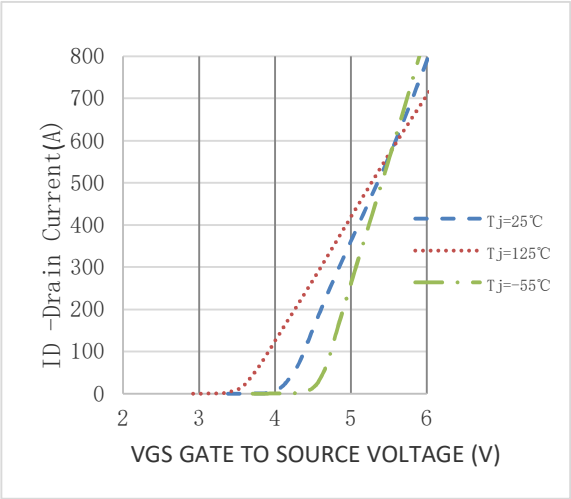


Fig.11 Safe Operating Area

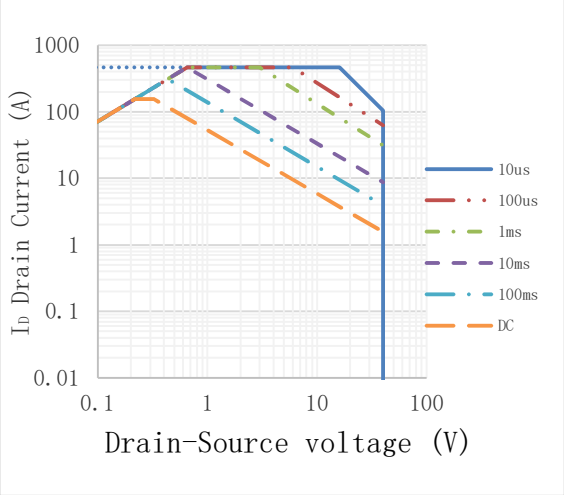
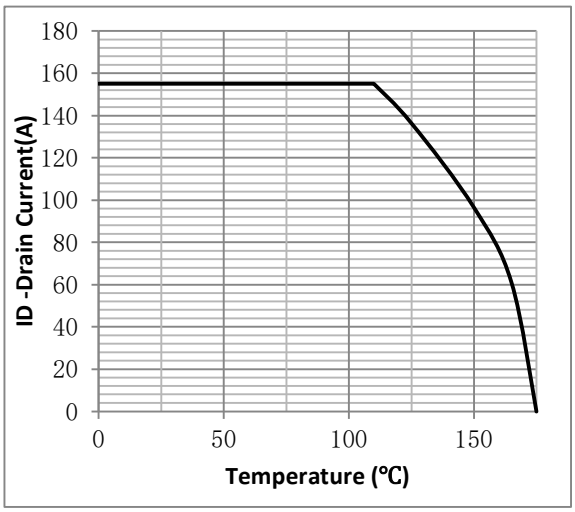
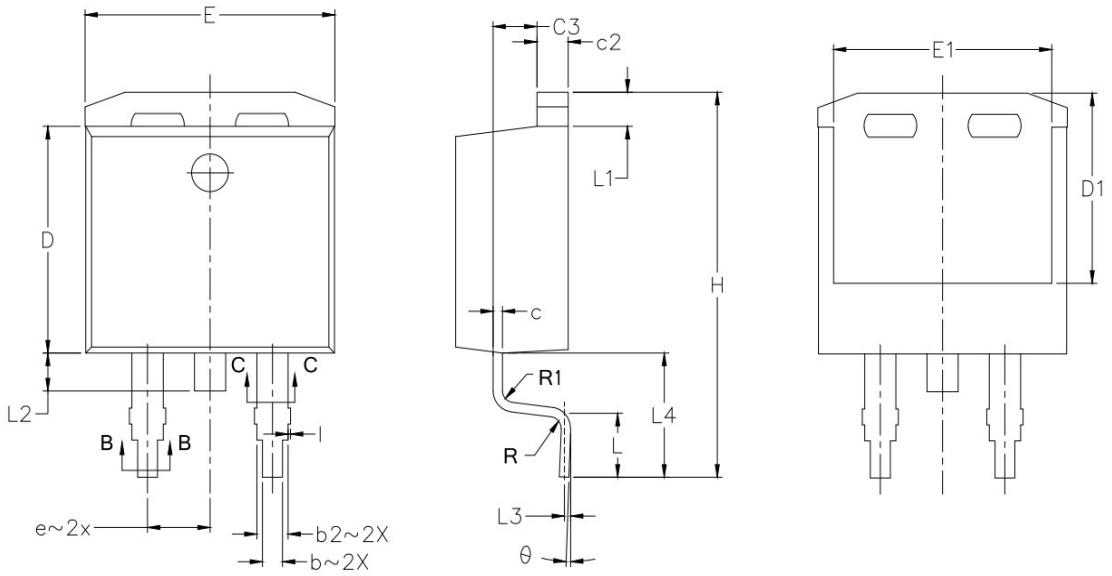
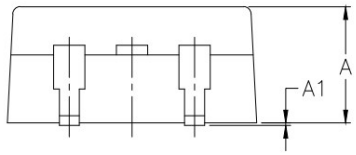


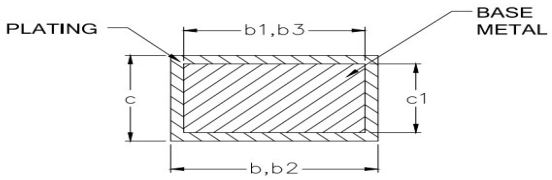
Fig.12 ID vs. Case Temperature③



●TO-263 Package Outline







SYMBOLS	COMMON			
	MM		INCH	
	MIN.	MAX.	MIN.	MAX.
A	4.064	4.826	0.160	0.190
A1	0.000	0.254	0.000	0.010
b	0.508	0.991	0.020	0.039
b1	0.508	0.889	0.020	0.035
b2	1.143	1.778	0.045	0.070
b3	1.143	1.727	0.045	0.068
c	0.381	0.737	0.015	0.029
c1	0.381	0.584	0.015	0.023
c2	1.143	1.651	0.045	0.065
D	8.382	9.652	0.330	0.380
D1	6.858	——	0.270	——
E	9.652	10.668	0.380	0.420
E1	6.223	——	0.245	——
e	2.540 BSC.		0.100 BSC.	
H	14.605	15.875	0.575	0.625
L	1.778	2.794	0.070	0.110
L1	——	1.676	——	0.066
L2	——	1.778	——	0.070
L3	0.254 BSC		0.010 BSC	
L4	4.780	5.280	0.188	0.208
R	0.460 TYP		0.018 TYP	
R1	0.460 TYP		0.018 TYP	
θ	0°	8°	0°	8°
C3	1.68	1.88	0.0661	0.0740
I	-	0.100	-	0.0039

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	1.Add Dynamic characteristics max limit 2.Add details of dimension drawing
D	2022.12.20	1.Modified id curve， junction temperature change to case
E	2023.12.18	Correct SOA
F	2024.12.12	Update Rdson value.