



General Description

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

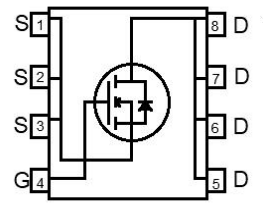
Ordering Information:

Part NO.	ZMSA012N06HNCD
Marking	ZMS012N06H
Packing Information	REEL TAPE
Basic ordering unit (pcs)	3000

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

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DS}		60	V
Gate-Source Voltage ^①	V_{GS}		± 20	V
Continuous Drain Current	I_D	$T_C=25^\circ\text{C}$	223	A
	I_D	$T_C=75^\circ\text{C}$	184	A
	I_D	$T_C=100^\circ\text{C}$	160	A
Pulsed Drain Current	I_{DM}	Pulsed; $t_p \leq 10 \mu\text{s}$; $T_{mb} = 25^\circ\text{C}$;	669	A
Total Power Dissipation	P_D	$T_C=25^\circ\text{C}$	176	W
Total Power Dissipation	P_D	$T_A=25^\circ\text{C}$	3.3	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}	$L=0.1\text{mH}$, $V_{GS}=10\text{V}$, $R_g=25\Omega$,	320	mJ
		$L=0.5\text{mH}$, $V_{GS}=10\text{V}$, $R_g=25\Omega$,	672	mJ
ESD Level (HBM)	CLASS 2			

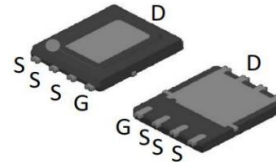
Product Summary



$$V_{DS} = 60\text{V}$$

$$R_{DS(ON)} = 1.25\text{m}\Omega$$

$$I_D = 223\text{A}$$



DSCQFN5*6





•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}		-	0.85	°C/W
Thermal resistance, junction-ambient	$R_{thJA}^{②}$		-	45	°C/W
Soldering temperature (total time<10s)	Tsold		-	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	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	2.0	2.7	4.0	V
Drain-Source Leakage Current	I_{DSS}	$V_{GS}=0V, V_{DS}=60V$			1.0	μA
Gate- Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$			100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=40A$		1.25	1.65	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_{SD}=10A$		15		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	C_{iss}	$f=1MHz, V_{DS}=25V$	-	4950	6435	pF
Output capacitance	C_{oss}		-	1800	2340	
Reverse transfer capacitance	C_{rss}		-	72	94	
Gate Resistance	R_g	$f=1MHz$	-	1.6	2.7	Ω
Total gate charge	Q_g	$V_{DD}=15V,$ $I_D=20A,$ $V_{GS}=10V$	-	67	87	nC
Gate - Source charge	Q_{gs}		-	17	22	
Gate - Drain charge	Q_{gd}		-	14	18	
Turn-ON Delay time	$t_{D(on)}$	$V_{GS}=10V, V_{DS}=15V,$ $R_G=3.3\Omega, I_D=20A$	-	15	19.5	ns
Turn-ON Rise time	t_r		-	10	13	ns
Turn-Off Delay time	$t_{D(off)}$		-	26	34	ns
Turn-Off Fall time	t_f		-	17	22	ns
Reverse Recovery Time	t_{RR}	$V_{DD}=20V, dI_S/dt=$ $100A/\mu s, I_S=50A$	-	48	62	ns
Reverse Recovery Charge	Q_{RR}		-	47	61	nC



Fig.1 Gate-Charge Characteristics

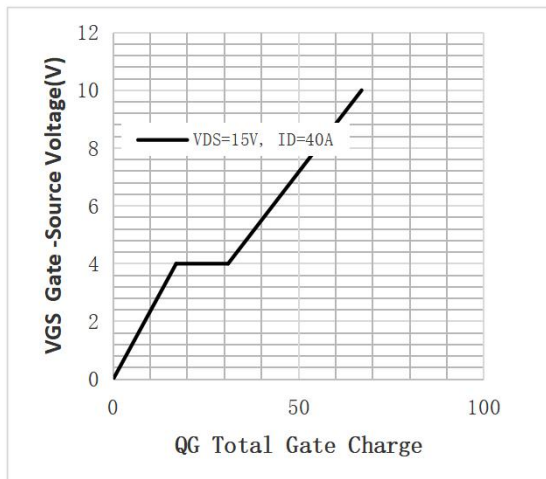


Fig.2 Capacitance Characteristics

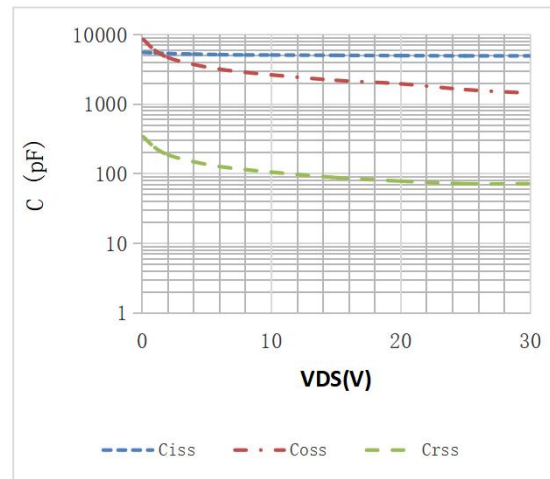


Fig.3 Power Dissipation

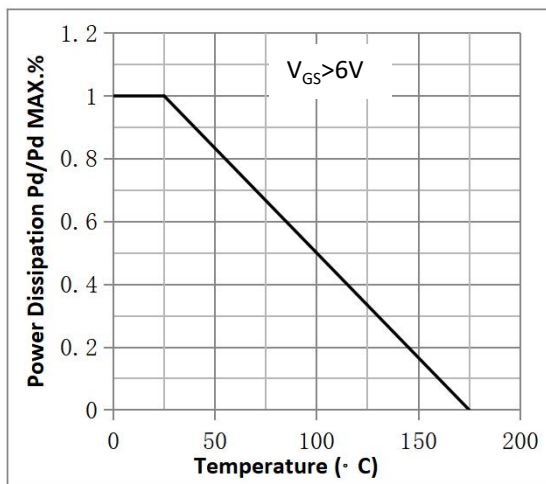


Fig.4 Typical output Characteristics

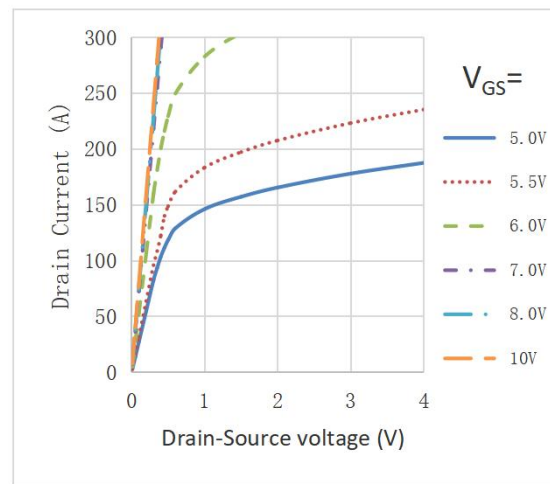


Fig.5 Threshold Voltage V.S Junction Temperature

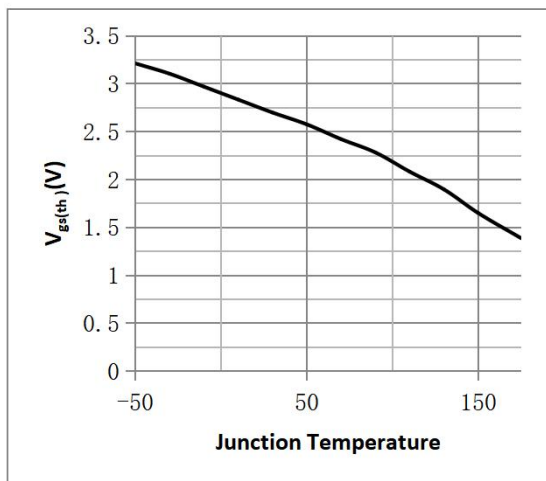


Fig.6 Resistance V.S Drain Current

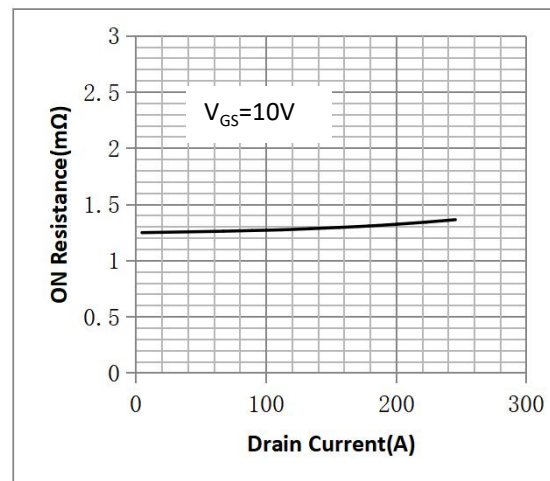


Fig.7 On-Resistance VS Gate Source Voltage

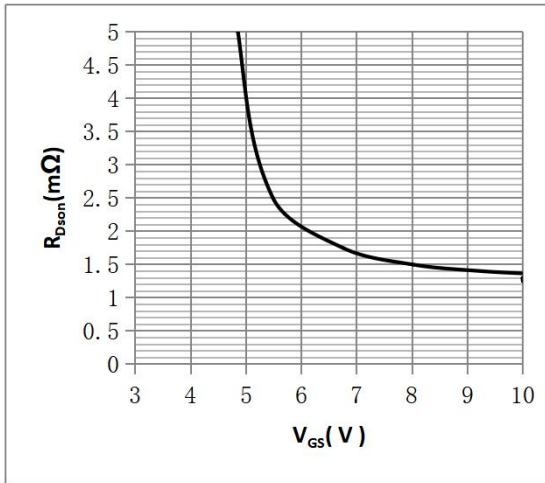


Fig.8 On-Resistance V.S Junction Temperature

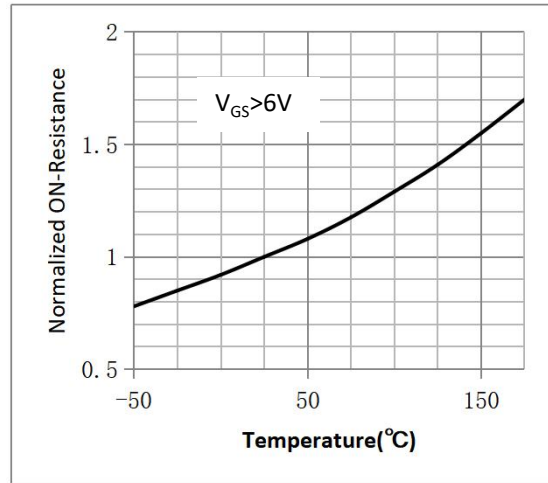


Figure 9. Diode Forward Voltage vs. Current

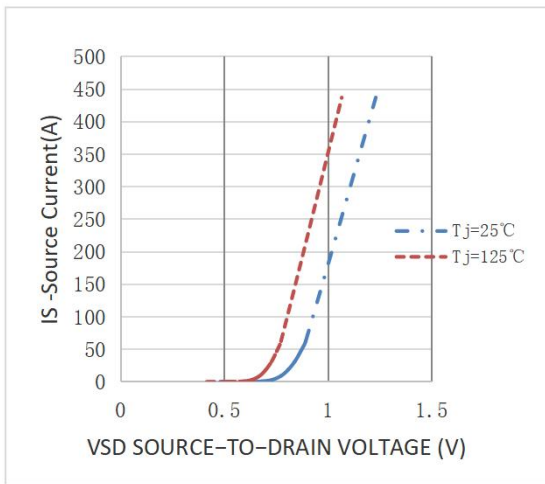


Figure 10. Transfer Characteristics

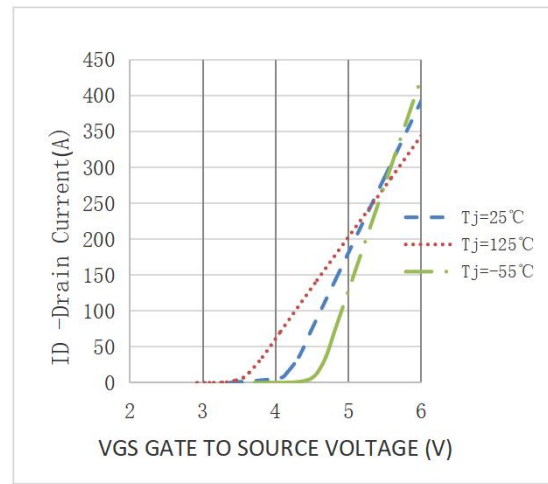


Fig.11 Safe Operating Area

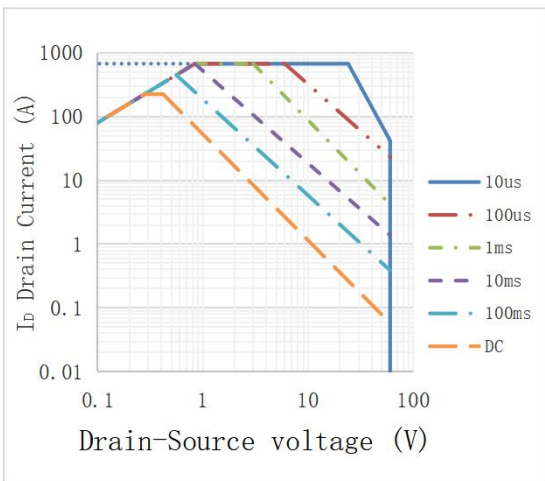
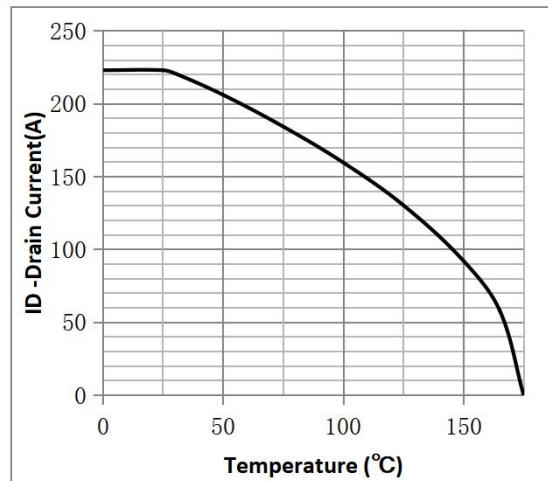
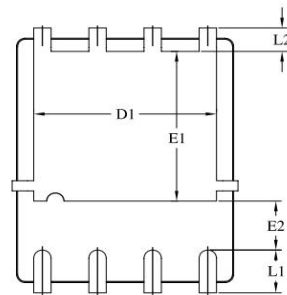
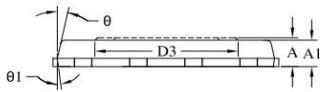
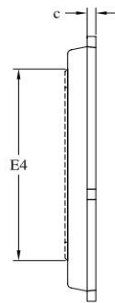
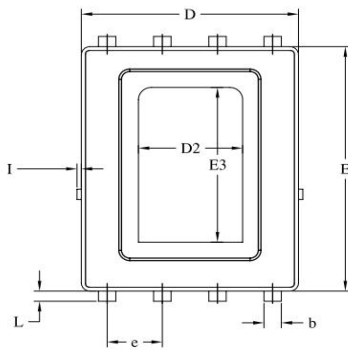


Fig.12 I_D vs. Junction Temperature^③





•DFN5*6 Package Outline



S Y M B O L	COMMON		
	MIN.	Nom.	MAX.
A	0.660	0.710	0.760
A1	0.600	-----	0.750
b	0.330	0.430	0.530
c	0.150	0.203	0.300
D	5.00 Bsc.		
D1	4.060	4.210	4.360
D2	2.400 Bsc.		
D3	2.800	3.300	3.800
E	6.00 Bsc.		
E1	3.525	3.675	3.825
E2	1.050	1.200	1.350
E3	3.800 Bsc.		
E4	4.200	4.700	5.200
e	1.270 Bsc.		
I	-----	-----	0.150
L	0.150	0.250	0.350
L1	0.925	1.050	1.175
L2	0.450	0.575	0.700
theta	12° Bsc.		
theta 1	7° Bsc.		

**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	2023.8.12	NEW
B	2024.2.29	Correct ciss,Qg