

• General Description

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

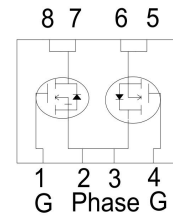
• Features

- AEC-Q101 Qualified
- Low  $R_{DS(ON)}$  to minimize conductive loss
- Low Gate Charge for fast switching
- Half-Bridge - N-channel

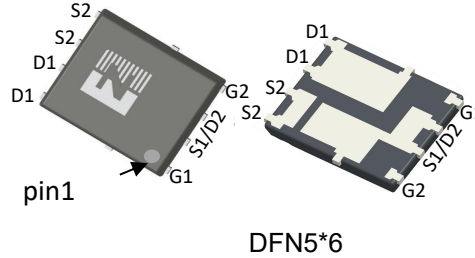
• Application

- BLDC Motor driver
- DC-DC

• Product Summary



$V_{DS} = 40V$   
 $R_{DS(ON)} = 5.5m\Omega$   
 $I_D = 54A$



• Ordering Information:

Part NO.	ZMDA68412HNB
Marking	ZMD68412H
Packing Information	REEL TAPE
Basic ordering unit (pcs)	3000

• Absolute Maximum Ratings ( $T_C=25^\circ C$ )

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	$V_{DS}$		40	V
Gate-Source Voltage <sup>①</sup>	$V_{GS}$		$\pm 20$	V
Continuous Drain Current	$I_D$	$T_C=25^\circ C$	54	A
	$I_D$	$T_C=75^\circ C$	45	A
	$I_D$	$T_C=100^\circ C$	39	A
Pulsed Drain Current	$I_{DM}$	Pulsed; $t_p \leq 10 \mu s$ ; $T_{mb} = 25^\circ C$ ;	216	A
Total Power Dissipation	$P_D$	$T_C=25^\circ C$	38	W
Total Power Dissipation	$P_D$	$T_A=25^\circ C$	3.3	W
Operating Junction Temperature	$T_J$		-55 to +175	$^\circ C$
Storage Temperature	$T_{STG}$		-55 to +175	$^\circ C$
Single Pulse Avalanche Energy	$E_{AS}$	$L=0.1mH, V_{GS}=10V, R_g=25\Omega,$	25	mJ
		$L=0.5mH, V_{GS}=10V, R_g=25\Omega,$	40	mJ
ESD Level (HBM)	CLASS 2			

**•Thermal resistance**

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	$R_{thJC}$		-	4	$^{\circ}C/W$
Thermal resistance, junction-ambient <sup>②</sup>	$R_{thJA}$		-	45	$^{\circ}C/W$
Soldering temperature	$T_{sold}$		-	260	$^{\circ}C$

**•Electronic Characteristics**

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	40			V
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	2	2.7	4	V
Drain-Source Leakage Current	$I_{DSS}$	$V_{GS}=0V, V_{DS}=40V$			1.0	$\mu A$
Gate- Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$			100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=14A$		5.5	6.1	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_{SD}=10A$		20		S
Diode Forward Voltage	$V_{FSD}$	$V_{GS}=0V, I_{SD}=14A$			1.3	V

**•Dynamic characteristics**

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	$C_{iss}$	$f=1MHz, V_{DS}=25V$	-	597	-	pF
Output capacitance	$C_{oss}$		-	205	-	
Reverse transfer capacitance	$C_{rss}$		-	10	-	
Gate Resistance	$R_g$	$f=1MHz$	-	1.6		$\Omega$
Total gate charge	$Q_g$	$V_{DD}=15V, I_D=14A, V_{GS}=10V$	-	6.7	-	nC
Gate - Source charge	$Q_{gs}$		-	1.3	-	
Gate - Drain charge	$Q_{gd}$		-	2.3	-	
Turn-ON Delay time	$t_{D(on)}$	$V_{GS}=10V, V_{DS}=15V, R_G=3.3\Omega, I_D=20A$	-	6	-	ns
Turn-ON Rise time	$t_r$		-	5	-	ns
Turn-Off Delay time	$t_{D(off)}$		-	15	-	ns
Turn-Off Fall time	$t_f$		-	4	-	ns
Reverse Recovery Time	$t_{RR}$		$V_{DD}=20V, di_S/dt = 100A/\mu s, I_S=20A$	-	31	-
Reverse Recovery Charge	$Q_{RR}$		-	44	-	nC

Fig.1 Gate-Charge Characteristics

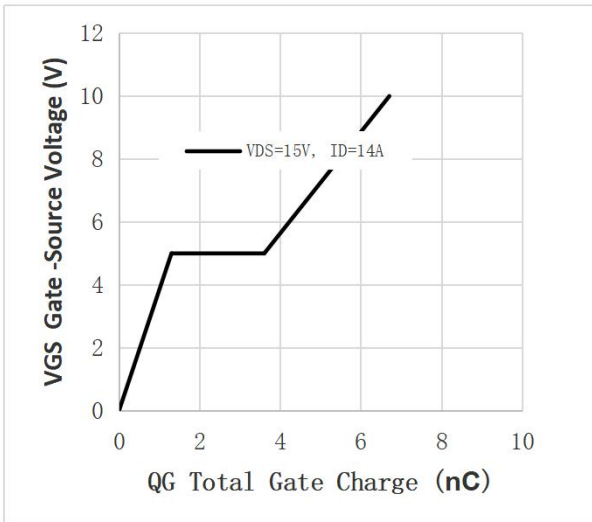


Fig.2 Capacitance Characteristics

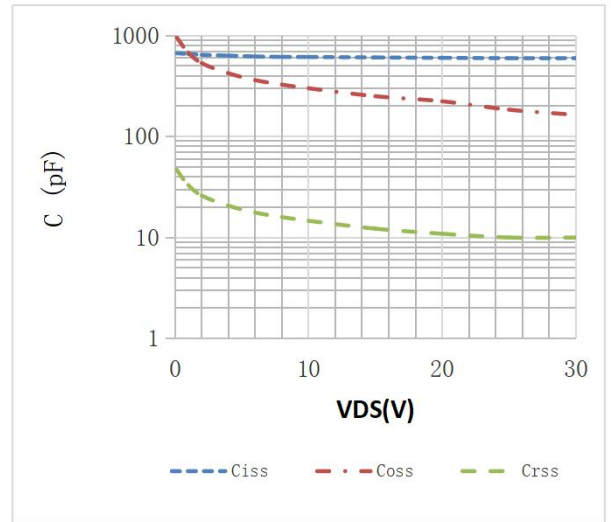


Fig.3 Power Dissipation

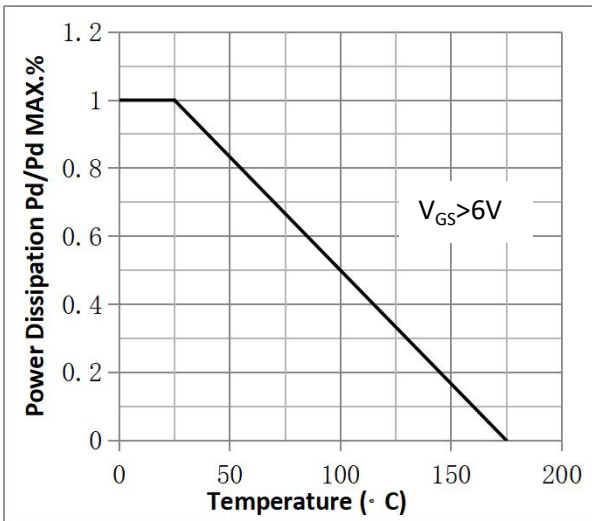


Fig.4 Typical output Characteristics

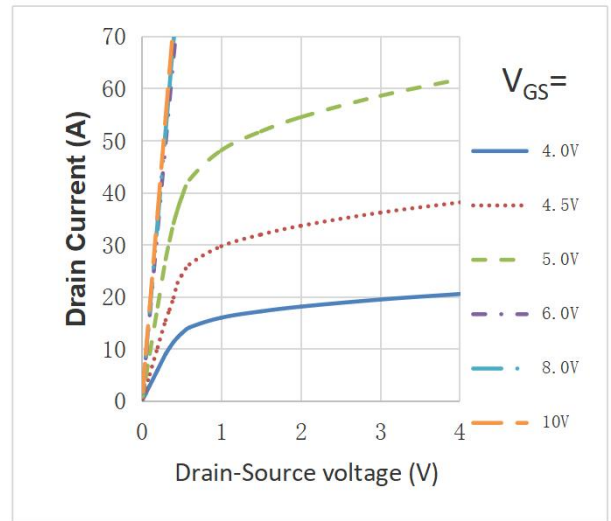


Fig.5 Threshold Voltage V.S Junction Temperature

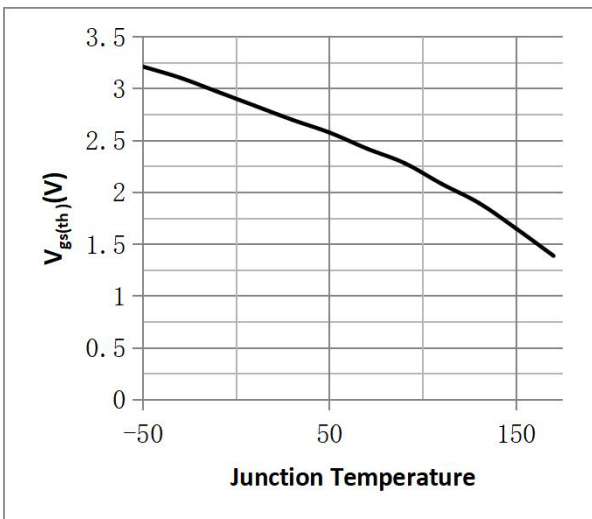


Fig.6 Resistance V.S Drain Current

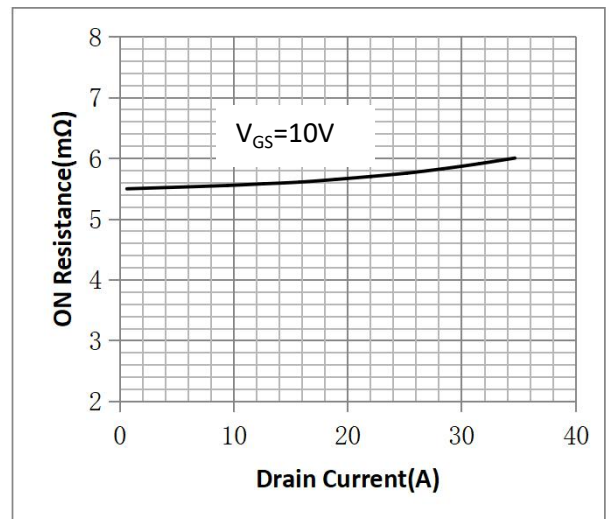


Fig.7 On-Resistance VS Gate Source Voltage

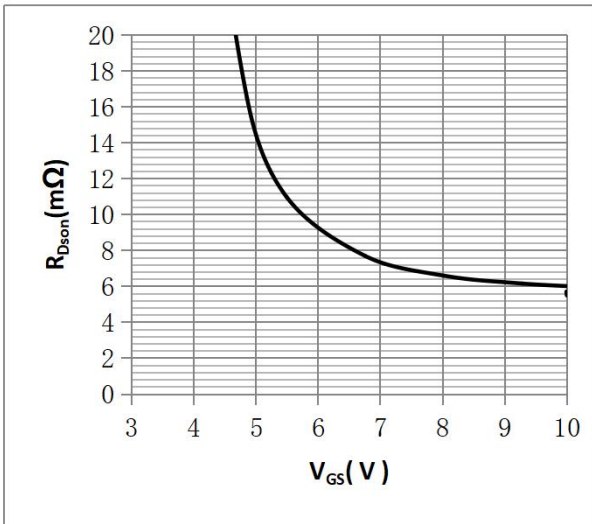


Fig.8 On-Resistance V.S Junction Temperature

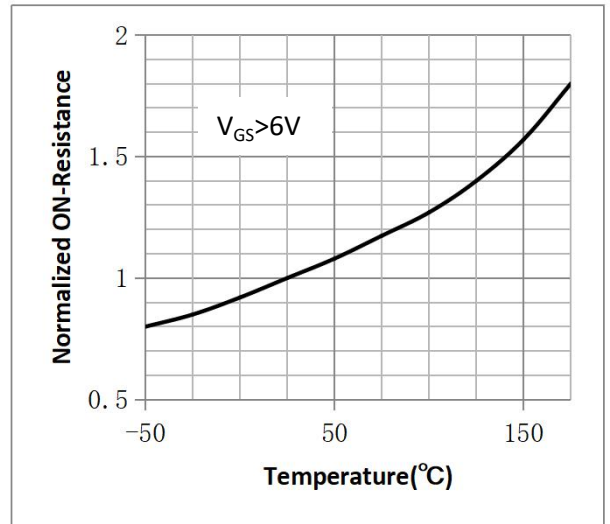


Figure 9. Diode Forward Voltage vs. Current

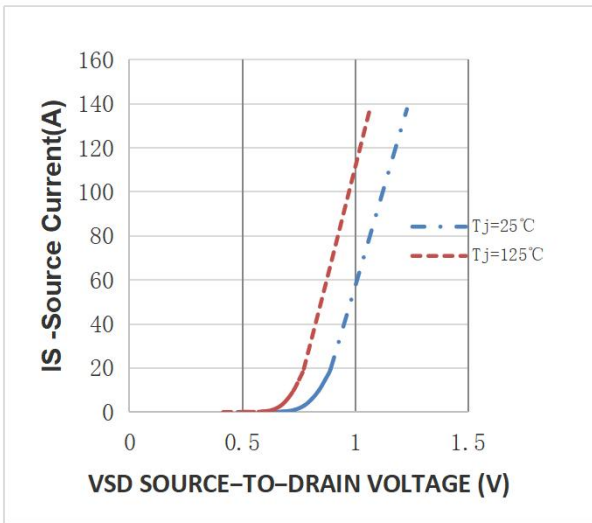


Figure 10. Transfer Characteristics

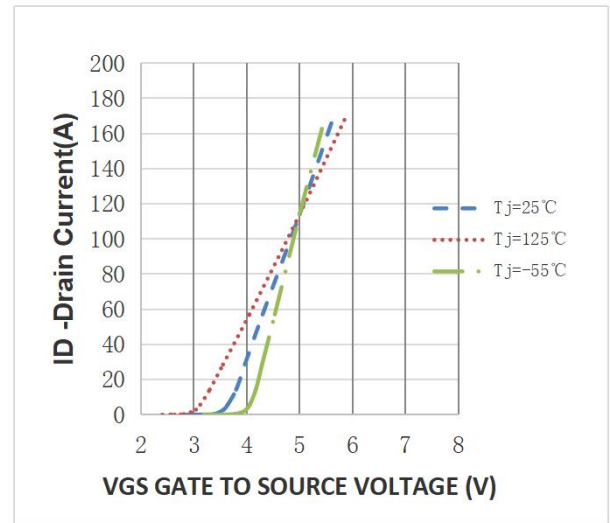


Fig.11 Safe Operating Area

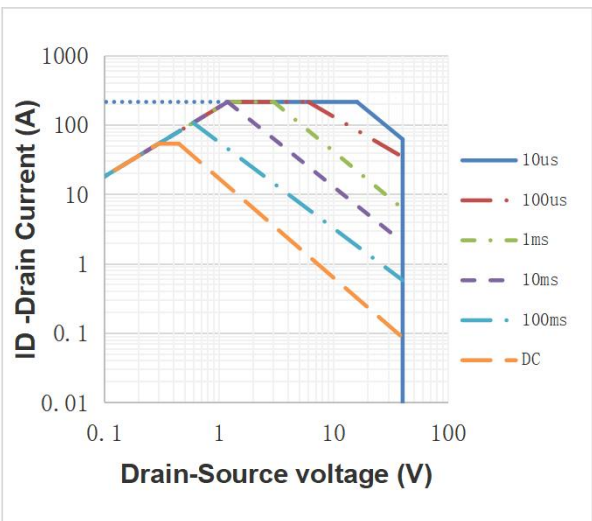
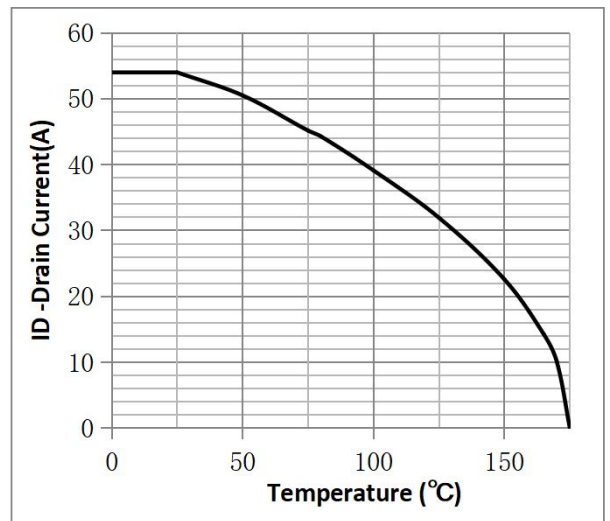
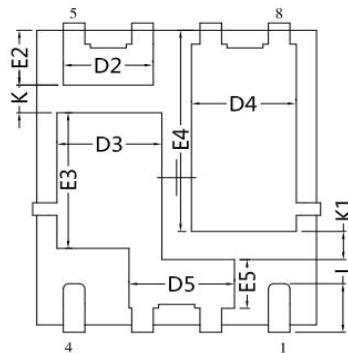
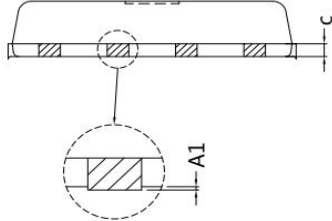
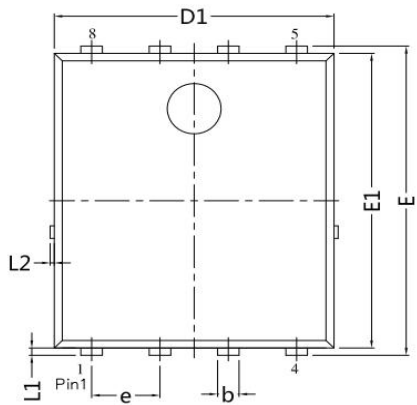


Fig.12 ID vs. Case Temperature<sup>③</sup>



•DFN5\*6 Package Outline



DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	1.00	1.10	1.20
A1	0	---	0.05
b	0.30	0.40	0.50
c	0.20	0.25	0.30
D1	5.10	5.20	5.30
D2	1.52	1.67	1.82
D3	1.78	1.95	2.10
D4	1.78	1.95	2.10
D5	1.81	1.96	2.11
E	6.00	6.15	6.30
E1	5.76	5.86	5.96
E2	0.94	1.09	1.24
E3	2.55	2.70	2.85
E4	3.85	4.0	4.15
E5	0.82	0.97	1.12
e	1.27 BSC		
L	0.90	0.96	1.06
L1	0.05	0.15	0.25
L2	0.02	0.08	0.15
K	0.55	---	---
K1	0.56	---	---

**Note:**

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

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Revision History

Version	Date	Change
A	2024/9/4	New
B	2024/9/12	Modified ciss, Qg VTH etc.