

60V N-Channel Power SpeedFET

• General Description

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

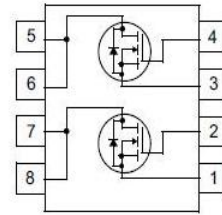
• Features

- AEC-Q101 Qualified
- Low $R_{DS(ON)}$ to minimize conductive loss
- Low Gate Charge for fast switching
- Low Thermal resistance

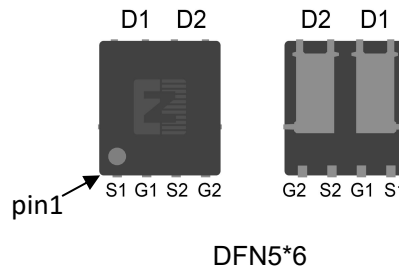
• Application

- BLDC Motor driver
- DC-DC
- Battery protection

• Product Summary



$V_{DS} = 60V$
 $R_{DS(ON)} = 10m\Omega$
 $I_D = 32A$



• Ordering Information:

Part NO.	ZMDA68606N
Marking	ZMD68606
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}		60	V
Gate-Source Voltage ^①	V_{GS}		± 20	V
Continuous Drain Current	I_D	$T_C=25^\circ C$	32	A
	I_D	$T_C=75^\circ C$	28	A
	I_D	$T_C=100^\circ C$	24	A
Pulsed Drain Current	I_{DM}	Pulsed; $t_p \leq 10 \mu s$; $T_{mb} = 25^\circ C$;	128	A
Total Power Dissipation	P_D	$T_C=25^\circ C$	36	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}	$L=0.1mH, V_{GS}=10V, R_g=25\Omega,$	18	mJ
		$L=0.5mH, V_{GS}=10V, R_g=25\Omega,$	32.4	mJ
ESD Level (HBM)			CLASS 1C	

•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}		-	4.2	°C/W
Thermal resistance, junction-ambient ^②	R_{thJA}		-	45	°C/W
Soldering temperature	T_{sold}		-	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	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	1.4	1.8	2.5	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	$R_{DS(ON)}$	$V_{GS}=10V, I_D=20A$		10	14	m Ω
		$V_{GS}=4.5V, I_D=16A$		13	17	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_{SD}=10A$		14		S
Diode Forward Voltage	V_{FSD}	$V_{GS}=0V, I_{SD}=20A$			1.3	V

•Dynamic characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	
Input capacitance	C_{iss}	$f=1MHz, V_{DS}=25V$	-	1040	-	pF	
Output capacitance	C_{oss}		-	690	-		
Reverse transfer capacitance	C_{rss}		-	34	-		
Gate Resistance	R_g	$f=1MHz$	-	2		Ω	
Total gate charge	Q_g	$V_{DD}=15V, I_D=20A, V_{GS}=10V$	-	19.5	-	nC	
	$Q_g(4.5v)$		-	9	-		
	Gate - Source charge		Q_{gs}	-	3.8		-
	Gate - Drain charge		Q_{gd}	-	2.8		-
Turn-ON Delay time	$t_{D(on)}$	$V_{GS}=10V, V_{DS}=15V, R_G=3.3\Omega, I_D=20A$	-	6.5	-	ns	
Turn-ON Rise time	t_r		-	4.4	-	ns	
Turn-Off Delay time	$t_{D(off)}$		-	18	-	ns	
Turn-Off Fall time	t_f		-	4.2	-	ns	
Reverse Recovery Time	t_{RR}	$V_{DD}=20V, di_s/dt=100A/\mu s, I_S=20A$	-	36	-	ns	
Reverse Recovery Charge	Q_{RR}		-	25	-	nC	

Fig.1 Gate-Charge Characteristics

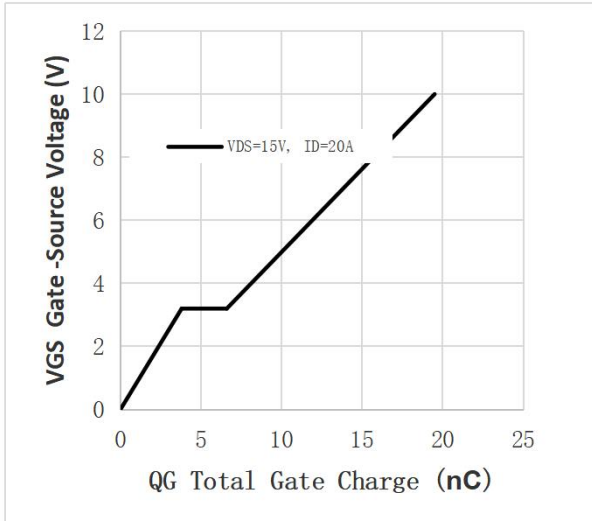


Fig.2 Capacitance Characteristics

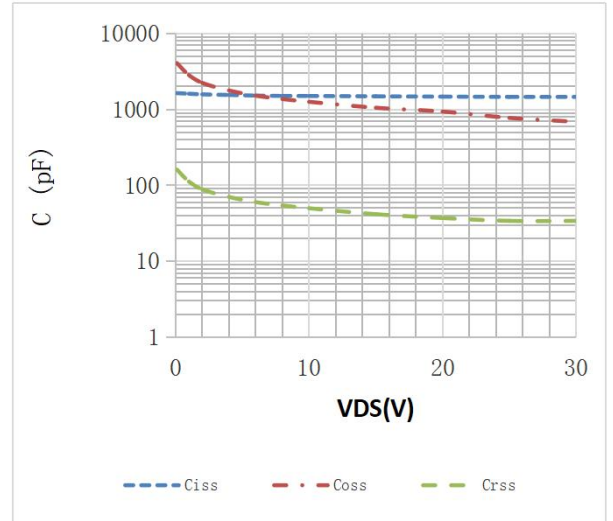


Fig.3 Power Dissipation

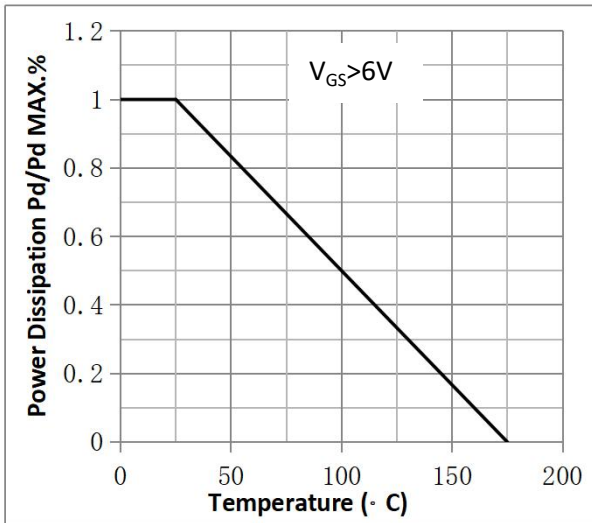


Fig.4 Typical output Characteristics

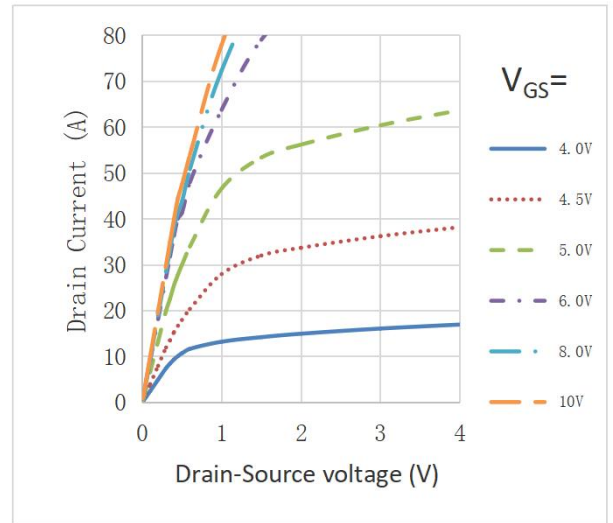


Fig.5 Threshold Voltage V.S Junction Temperature

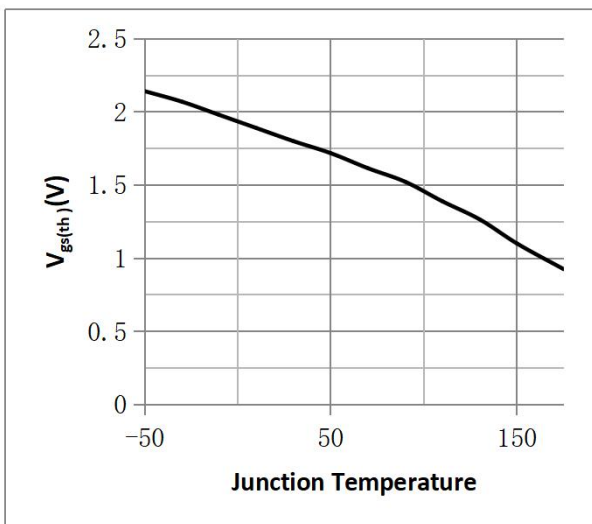


Fig.6 Resistance V.S Drain Current

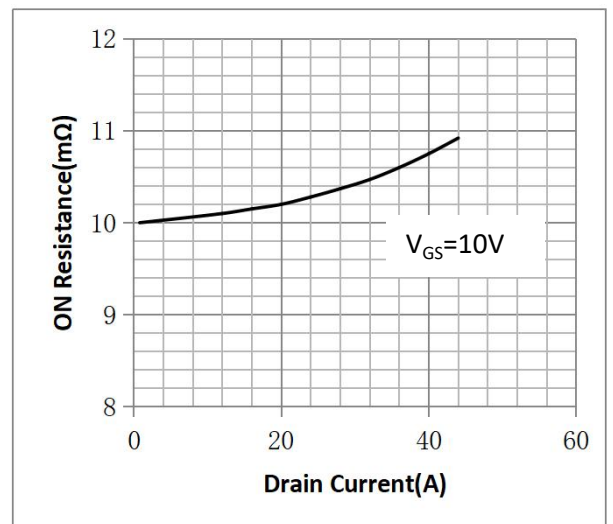


Fig.7 On-Resistance VS Gate Source Voltage

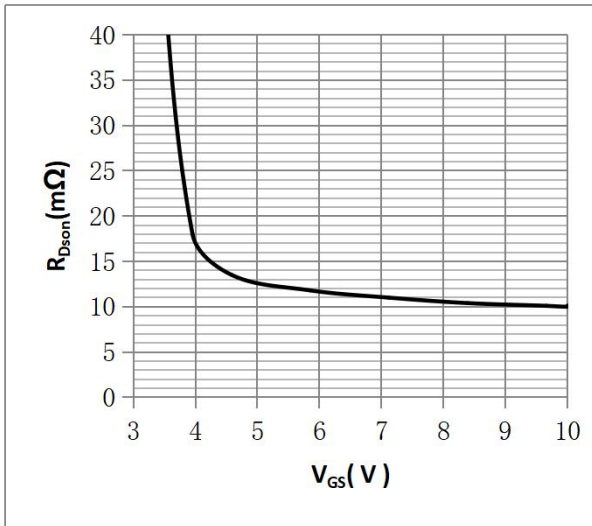


Fig.8 On-Resistance V.S Junction Temperature

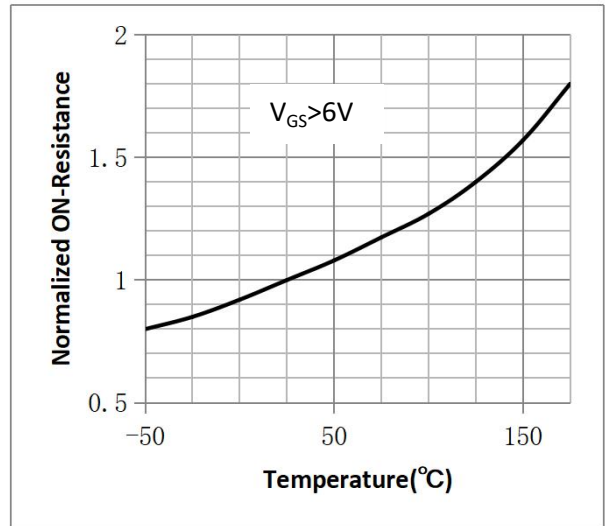


Figure 9. Diode Forward Voltage vs. Current

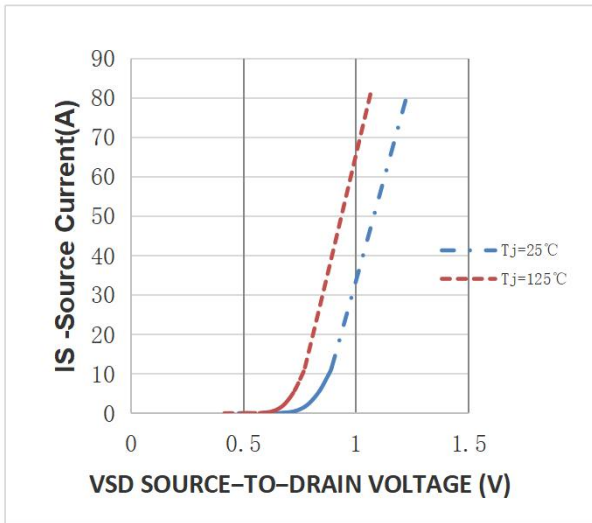


Figure 10. Transfer Characteristics

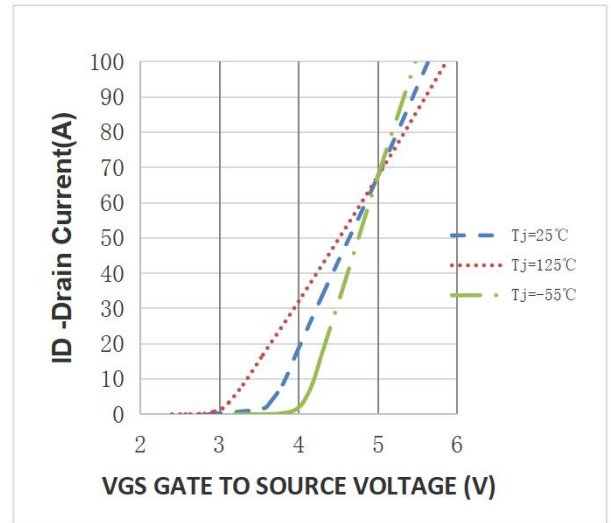


Fig.11 Safe Operating Area

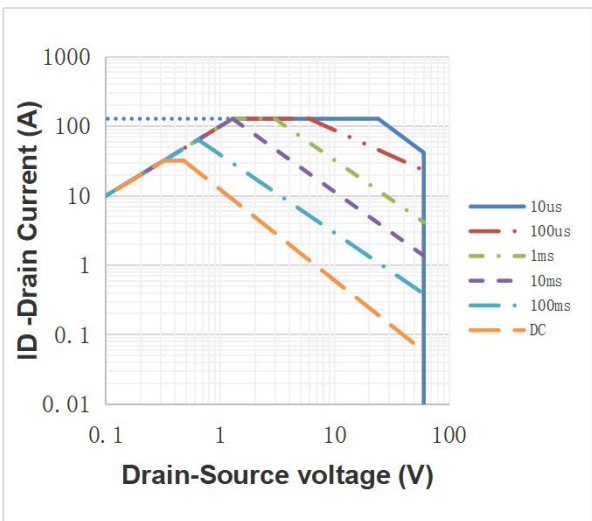
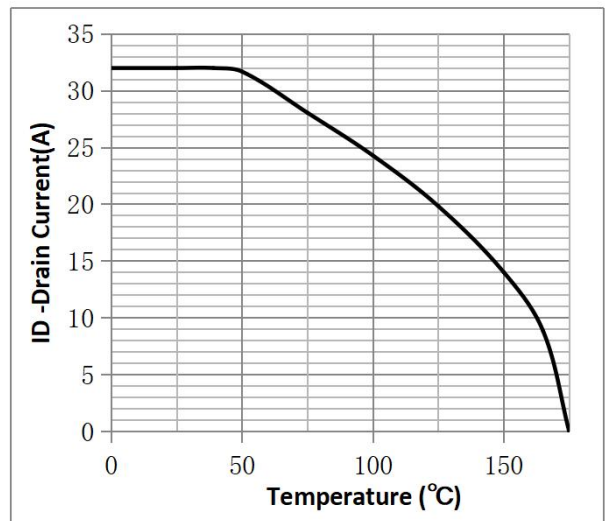
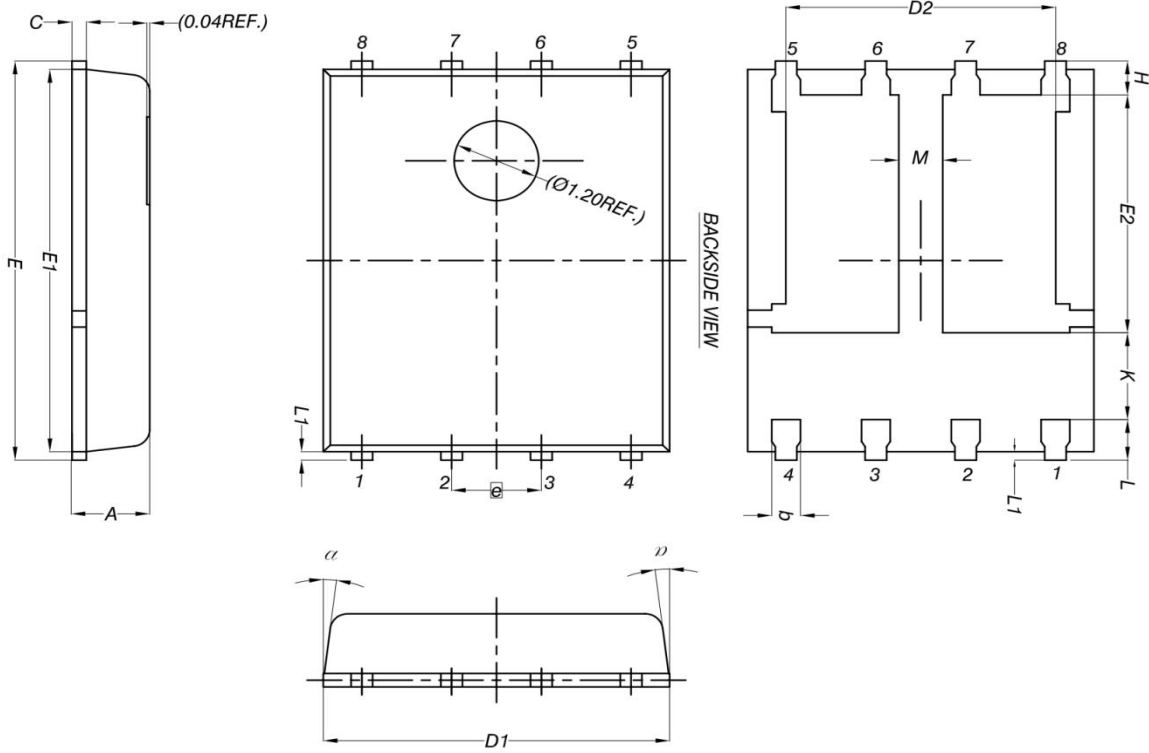


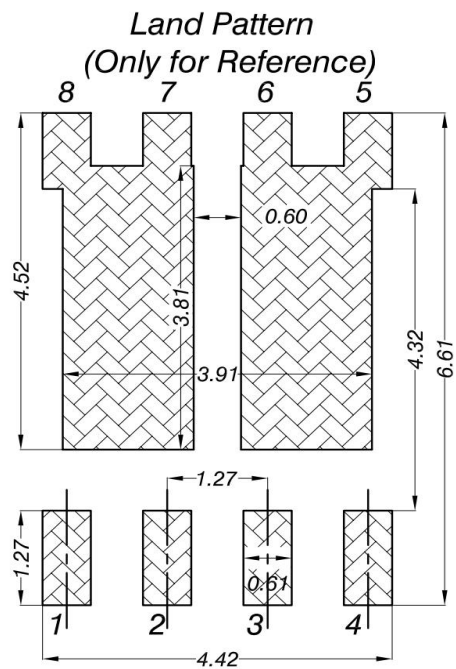
Fig.12 I_D vs. Case Temperature^③



•DFN5*6 Package Outline



DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
b	0.33	0.41	0.51
C	0.20	0.25	0.30
D1	4.80	4.90	5.00
D2	3.61	3.81	3.96
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.38	3.58	3.78
[e]	1.27 BSC		
H	0.41	0.51	0.61
K	1.10	-	-
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
M	0.50	-	-
α	0°	-	12°



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	2021.2.3	NEW
B	2021.10.5	Add 4.5V Qg
C	2022.9.12	1.Add Reach, HF figure 2.add Dynamic characteristics 3.Modify Characteristics curve
D	2023.2.23	Modify Ciss, Coss, Crss