

40V N-Channel Power MOSFET

• General Description

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

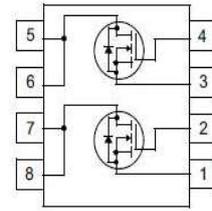
• Features

- 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

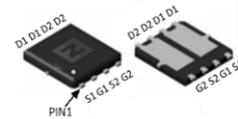
• Product Summary



$V_{DS} = 40V$

$R_{DS(ON)} = 13m\Omega$

$I_D = 21A$



DFN3\*3

• Ordering Information:

Part NO.	ZMDA68403M
Marking	68403
Packing Information	REEL TAPE
Basic ordering unit (pcs)	3000

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

Parameter	Symbol	Conditions	Min.	Max.	Unit
Drain-Source Voltage	$V_{DS}$	$25^\circ C < T_j < 175^\circ C$	40		V
Gate-Source Voltage	$V_{GS}$	Pulsed <sup>①</sup>	-20	20	V
Continuous Drain Current	$I_D$	$T_C=25^\circ C$		21	A
	$I_D$	$T_C=75^\circ C$		17	A
	$I_D$	$T_C=100^\circ C$		15	A
Pulsed Drain Current <sup>①</sup>	$I_{DM}$	Pulsed; $t_p < 10 \mu s$ ; $T_{mb} = 25^\circ C$		63	A
Total Power Dissipation	$P_D$	$T_C=25^\circ C$		18	W
Total Power Dissipation	$P_D$	$T_A=25^\circ C$		2.1	W
Operating Junction Temperature	$T_J$		-55	175	$^\circ C$
Storage Temperature	$T_{STG}$		-55	175	$^\circ C$
Single Pulse Avalanche Energy	$E_{AS}$	$L=0.1mH, V_{GS}=10V,$ $R_g=25\Omega,$		24	mJ
ESD Level (HBM)			CLASS 1C		

**•Thermal resistance**

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	$R_{thJC}$		-	8.4	°C/W
Thermal resistance, junction-ambient	$R_{thJA}^{\textcircled{2}}$		-	70	°C/W
Soldering temperature	$T_{sold}$		-	260	°C

**•Electronic Characteristics**

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	40			V
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\mu A$	1.3	1.7	2.5	V
Drain-Source Leakage Current	$I_{DSS}$	$V_{GS} = 0V, V_{DS} = 40V$			1	$\mu A$
Gate- Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS} = 0V$			100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 8A$		13	18	m $\Omega$
Diode Forward Voltage	$V_{FSD}$	$V_{GS} = 0V, I_{SD} = 8A$			1.3	V

**•Dynamic characteristics**

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	$C_{iss}$	$f = 1MHz, V_{DS} = 25V$	-	1190		pF
Output capacitance	$C_{oss}$		-	52	-	
Reverse transfer capacitance	$C_{rss}$		-	29	-	
Gate Resistance	$R_g$	$f = 1MHz$	-	2		$\Omega$
Total gate charge	$Q_g$	$V_{DD} = 15V, I_D = 10A$ $V_{GS} = 10V$	-	20	-	nC
Gate - Source charge	$Q_{gs}$		-	3.3	-	
Gate - Drain charge	$Q_{gd}$		-	3.6	-	
Turn-ON Delay time	$t_{D(on)}$	$V_{GS} = 10V, V_{DS} = 15V, R_G = 3.3\Omega, I_D = 10A$	-	19	-	ns
Turn-ON Rise time	$t_r$		-	45	-	ns
Turn-Off Delay time	$t_{D(off)}$		-	46	-	ns
Turn-Off Fall time	$t_f$		-	42	-	ns
Reverse Recovery Time	$t_{RR}$	$V_{DD} = 20V, dI_S/dt = 100A/\mu s, I_S = 10A$	-	21	-	ns
Reverse Recovery Charge	$Q_{RR}$		-	16	-	nC

Fig.1 Gate-Charge Characteristics

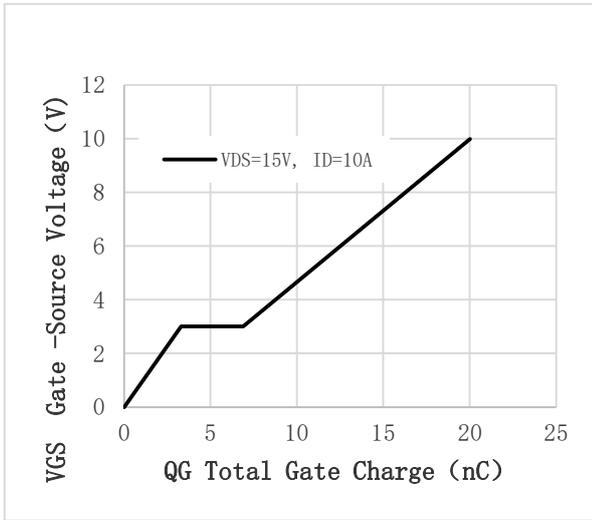


Fig.2 Capacitance Characteristics

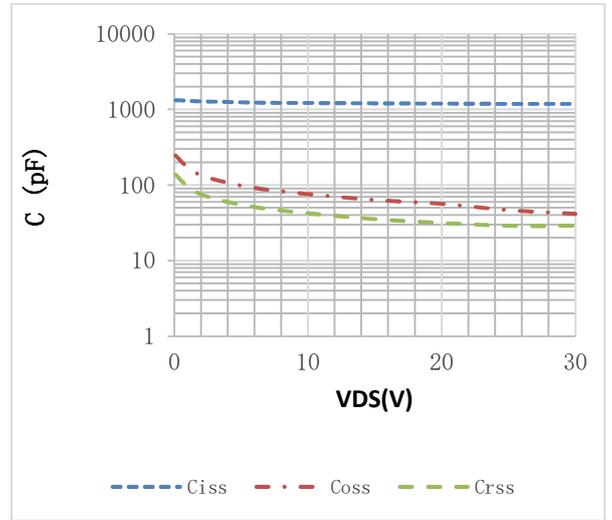


Fig.3 Power Dissipation

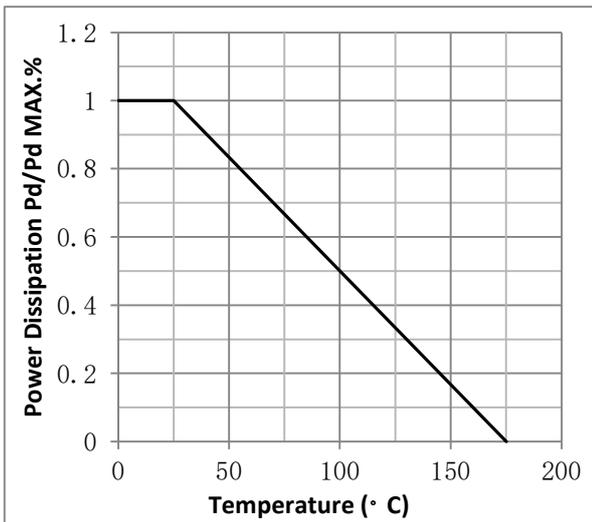


Fig.4 Typical output Characteristics

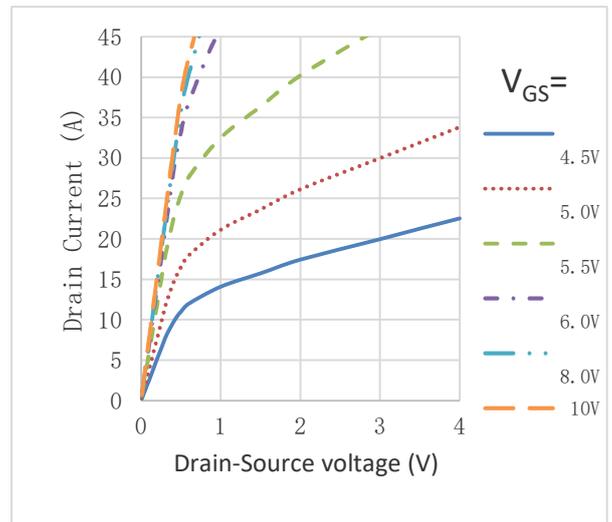


Fig.5 Threshold Voltage V.S Junction Temperature

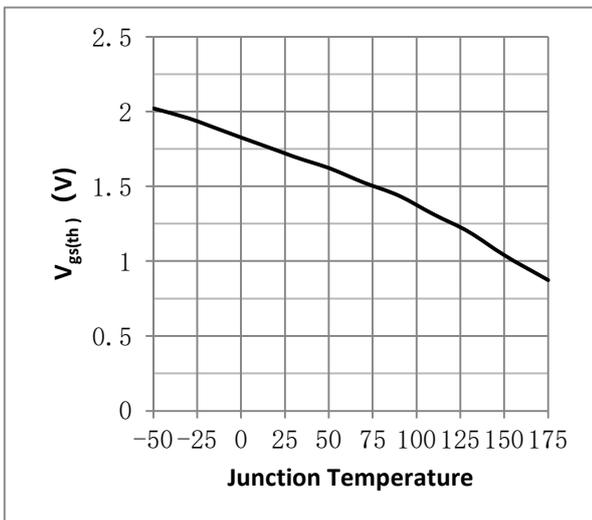


Fig.6 Resistance V.S Drain Current

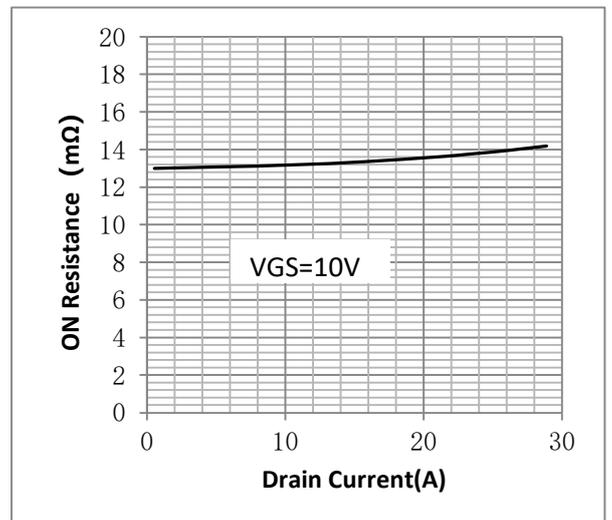


Fig.7 On-Resistance VS Gate Source Voltage

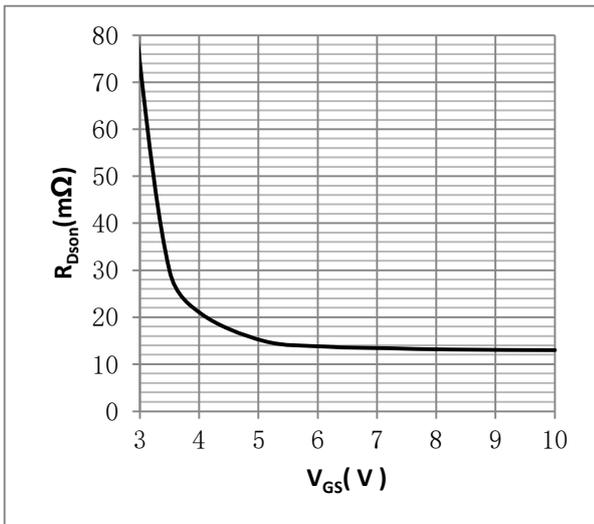


Fig.8 On-Resistance V.S Junction Temperature

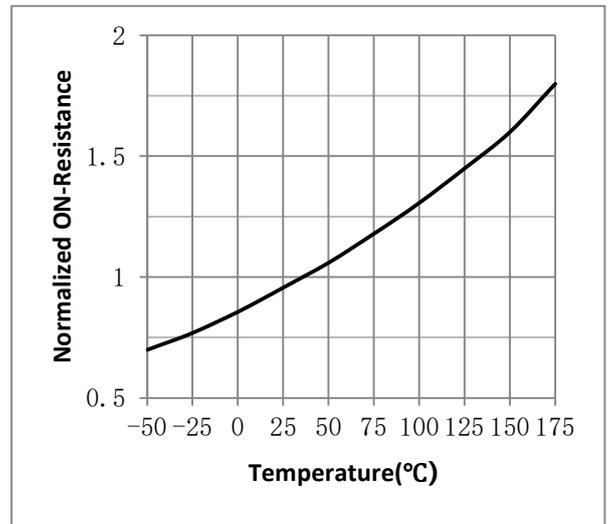


Figure 9. Diode Forward Voltage vs. Current

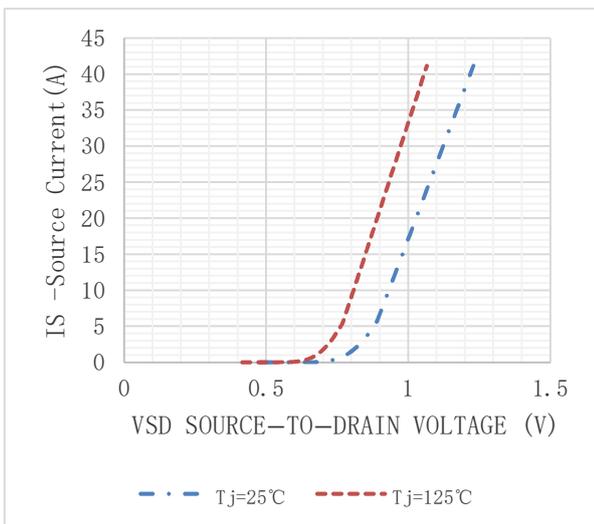


Figure 10. Transfer Characteristics

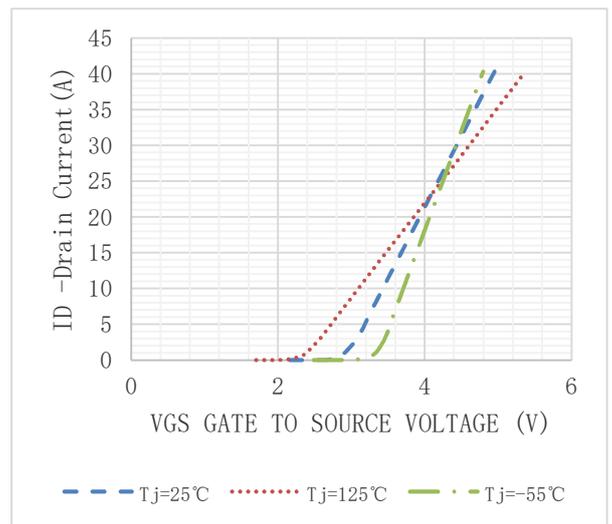


Fig.11 SOA Maximum Safe Operating Area

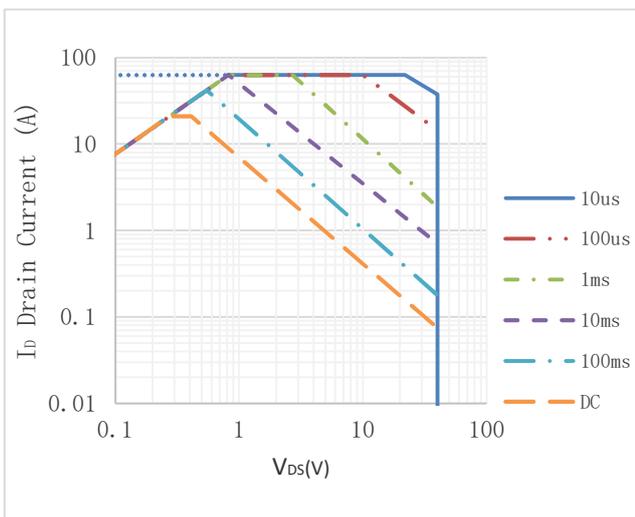
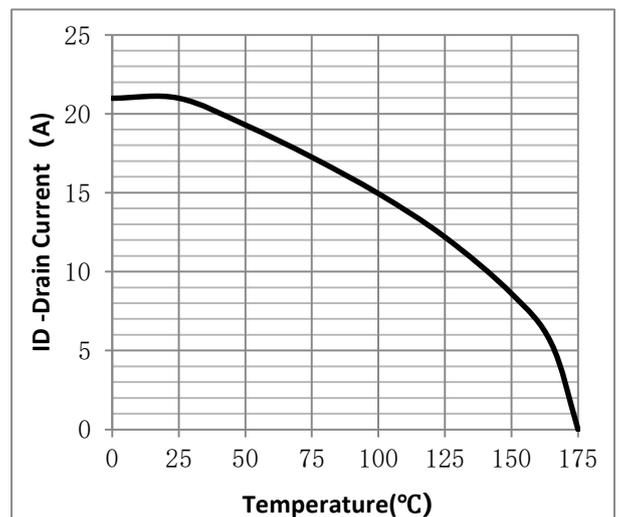
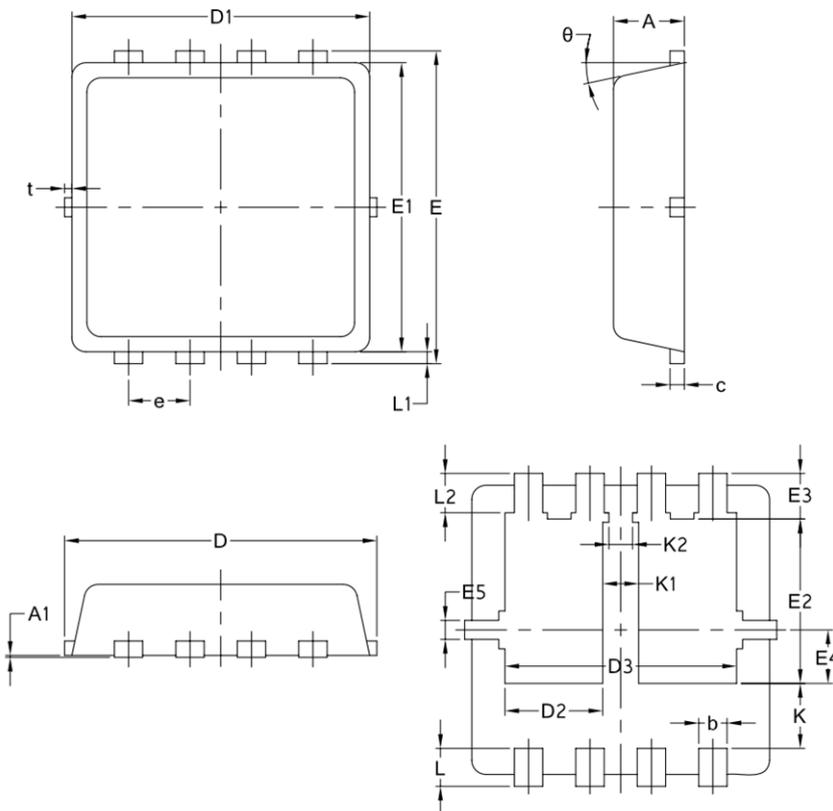


Fig.12  $I_D$  vs. Junction Temperature



•DFN3\*3 Package Outline



SYMBOL	COMMON		
	MM		
	MIN	NOM	MAX
A	0.70	0.75	0.85
A1	/	/	0.05
b	0.25	0.30	0.39
c	0.14	0.152	0.20
D	3.20	3.30	3.45
D1	3.05	3.15	3.25
D2	0.84	1.04	1.24
D3	2.30	2.45	2.60
E	3.20	3.30	3.40
E1	2.95	3.05	3.15
E2	1.60	1.74	1.90
E3	0.28	0.48	0.65
E4	0.37	0.57	0.77
E5	0.10	0.20	0.30
e	0.60	0.65	0.70
K	0.50	0.69	0.80
K1	0.30	0.38	0.53
K2	0.15	0.25	0.35
L	0.30	0.40	0.50
L1	0.06	0.125	0.20
L2	0.27	0.42	0.57
t	0	0.075	0.13
$\theta$	10°	12°	14°

**Note:**

- ① Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$
- ② Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate;

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