

• 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
- Load Switch

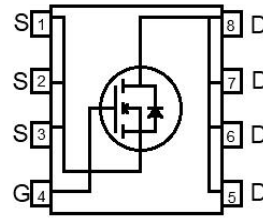
• Ordering Information:

Part NO.	ZMSA040N04HM
Marking	040N04H
Packing Information	REEL TAPE
Basic ordering unit (pcs)	5000

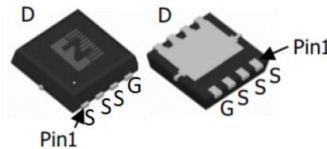
• Absolute Maximum Ratings ( $T_C=25^\circ\text{C}$ )

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	$V_{DS}$		40	V
Gate-Source Voltage	$V_{GS}$		$\pm 20$	V
Continuous Drain Current	$I_D$	$T_C=25^\circ\text{C}$	99	A
	$I_D$	$T_C=75^\circ\text{C}$	81	A
	$I_D$	$T_C=100^\circ\text{C}$	70	A
Pulsed Drain Current <sup>①</sup>	$I_{DM}$	Pulsed; $t_p \leq 10 \mu\text{s}$ ; $T_{mb} = 25^\circ\text{C}$ ;	396	A
Total Power Dissipation	$P_D$	$T_C=25^\circ\text{C}$	83	W
Total Power Dissipation	$P_D$	$T_A=25^\circ\text{C}$	2.5	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=0.1mH, VGS=10V, Rg=25 $\Omega$ ,	65	mJ
		L=0.5mH, VGS=10V, Rg=25 $\Omega$ ,	117	mJ
ESD Level (HBM)	CLASS 1C			

• Product Summary



$V_{DS} = 40\text{V}$   
 $R_{DS(ON)} = 3.5\text{m}\Omega$   
 $I_D = 99\text{A}$



DFN3\*3



**•Thermal resistance**

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	$R_{thJC}$		-	1.8	$^{\circ}C/W$
Thermal resistance, junction-ambient	$R_{thJA\ominus}$		-	60	$^{\circ}C/W$
Soldering temperature (total time<10s)	$T_{sold}$		-	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	2.9	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	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 18A$		3.5	4.2	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{GS} = 5V, I_{SD} = 5A$		14		S
Diode Forward Voltage	$V_{FSD}$	$V_{GS} = 0V, I_{SD} = 18A$			1.3	V

**•Dynamic characteristics**

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	$C_{iss}$	$f = 1MHz, V_{DS} = 25V, V_{GS} = 0V$	-	1301	-	pF
Output capacitance	$C_{oss}$		-	396	-	
Reverse transfer capacitance	$C_{rss}$		-	26	-	
Gate Resistance	$R_g$	$f = 1MHz$	-	1.2		$\Omega$
Total gate charge	$Q_g$	$V_{DD} = 15V, I_D = 18A, V_{GS} = 10V$	-	21	-	nC
Gate - Source charge	$Q_{gs}$		-	6.5	-	
Gate - Drain charge	$Q_{gd}$		-	5.5	-	
Turn-ON Delay time	$t_{D(on)}$	$V_{GS} = 10V, V_{DS} = 15V, R_G = 3.3\Omega, I_D = 20A$	-	3	-	ns
Turn-ON Rise time	$t_r$		-	4	-	ns
Turn-Off Delay time	$t_{D(off)}$		-	12	-	ns
Turn-Off Fall time	$t_f$		-	6	-	ns
Reverse Recovery Time	$t_{rr}$	$V_{DD} = 20V, di_S/dt = 100A/\mu s, I_S = 20A$	-	25	-	ns
Reverse Recovery Charge	$Q_{rr}$		-	12	-	nC

Fig.1 Gate-Charge Characteristics

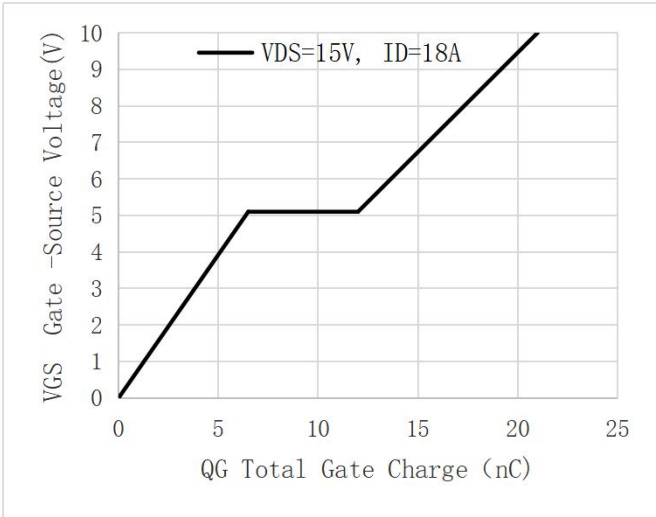


Fig.2 Capacitance Characteristics

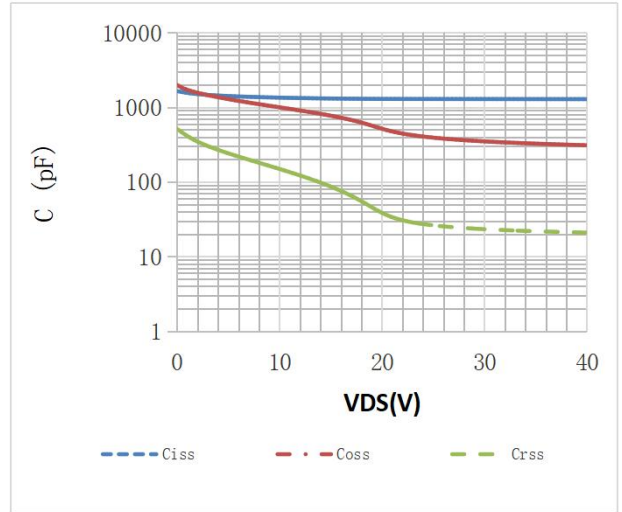


Fig.3 Power Dissipation

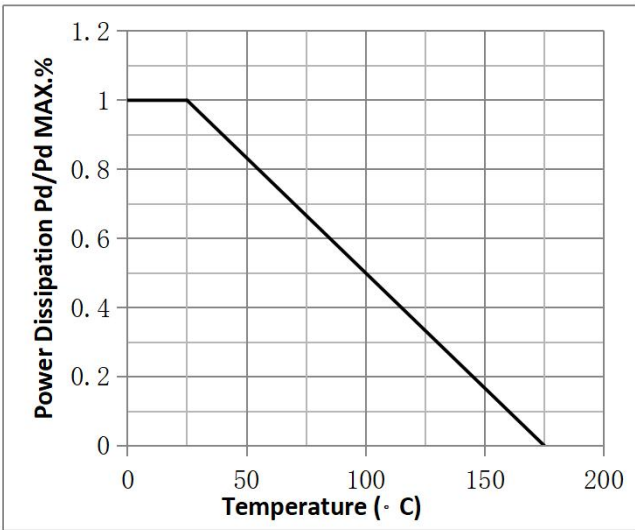


Fig.4 Typical output Characteristics

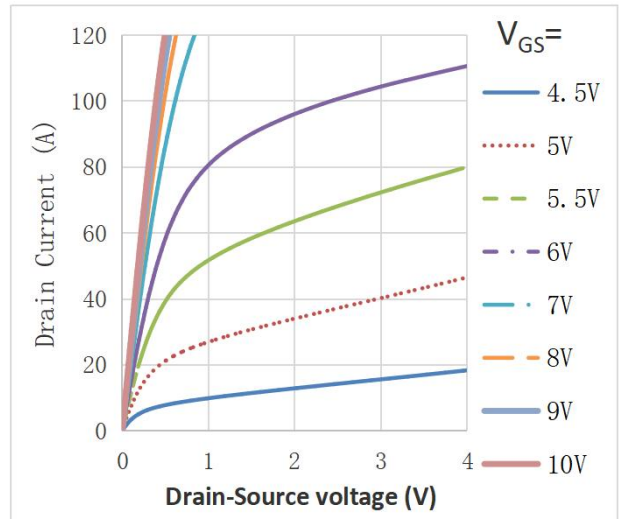


Fig.5 Threshold Voltage V.S Junction Temperature

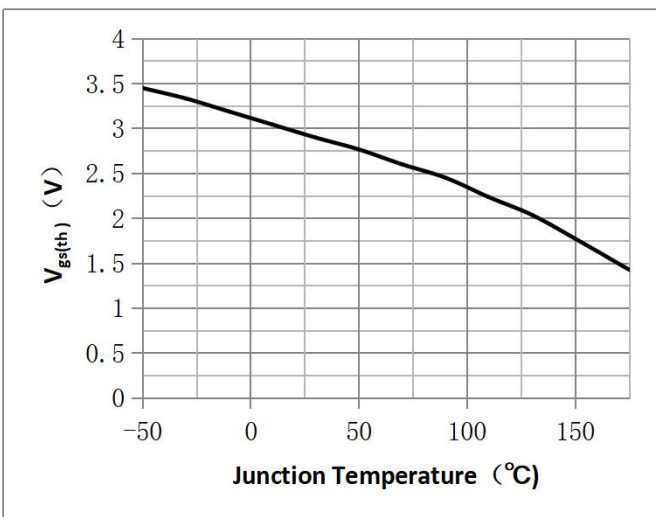


Fig.6 Resistance V.S Drain Current

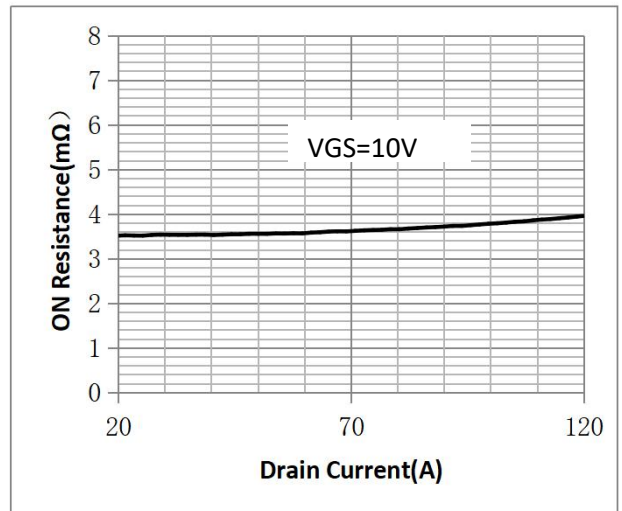


Fig.7 On-Resistance VS Gate Source Voltage

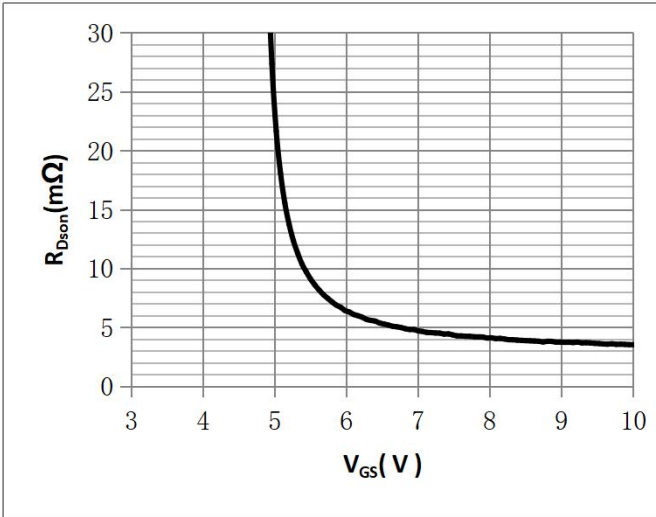


Fig.8 On-Resistance V.S Junction Temperature

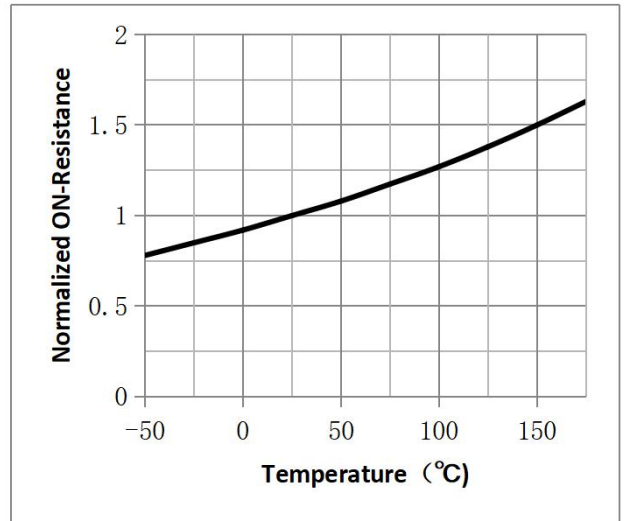


Figure 9. Diode Forward Voltage vs. Current

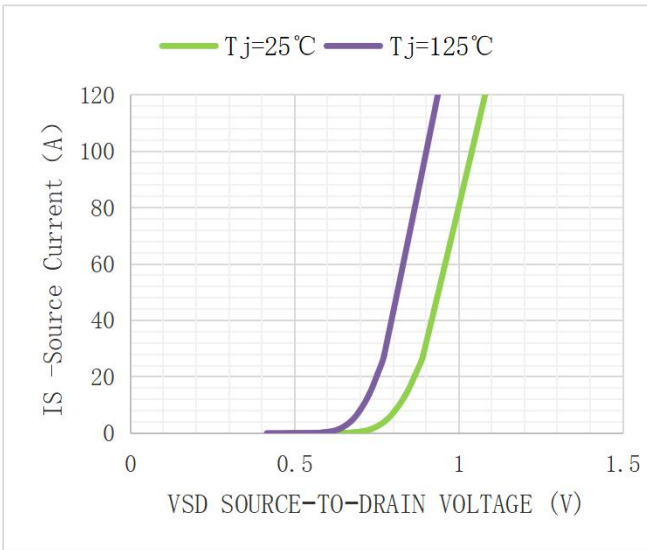


Figure 10. Transfer Characteristics

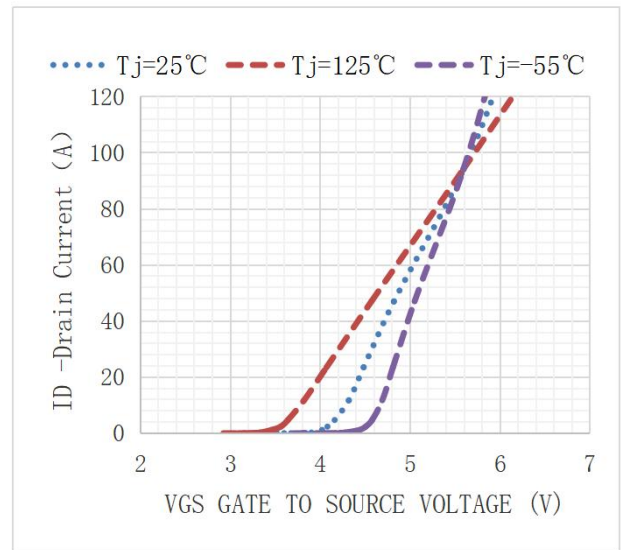


Fig.11 SOA Maximum Safe Operating Area

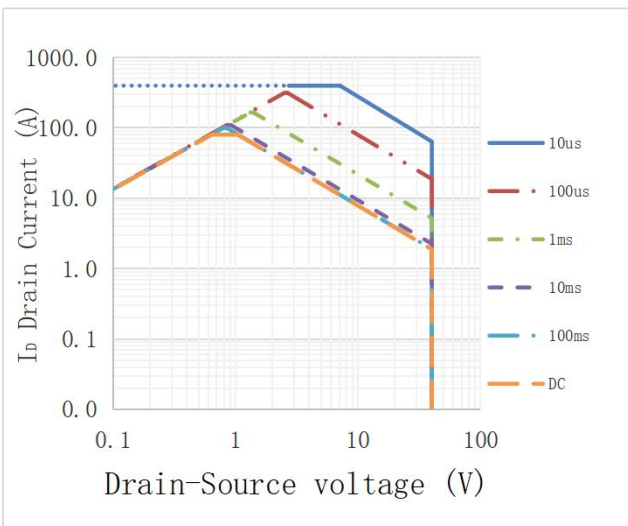
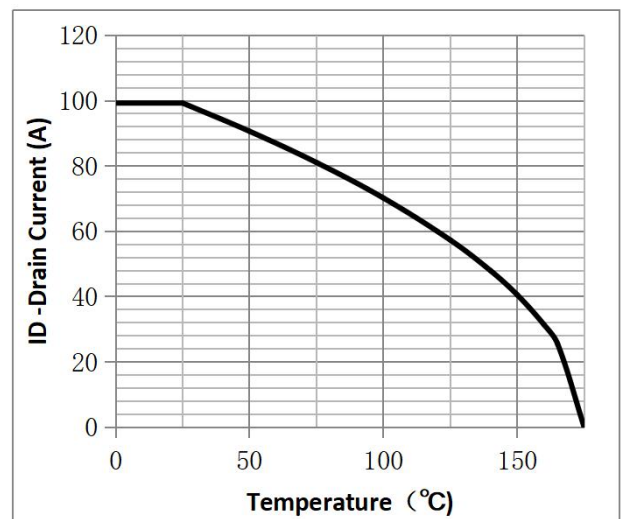
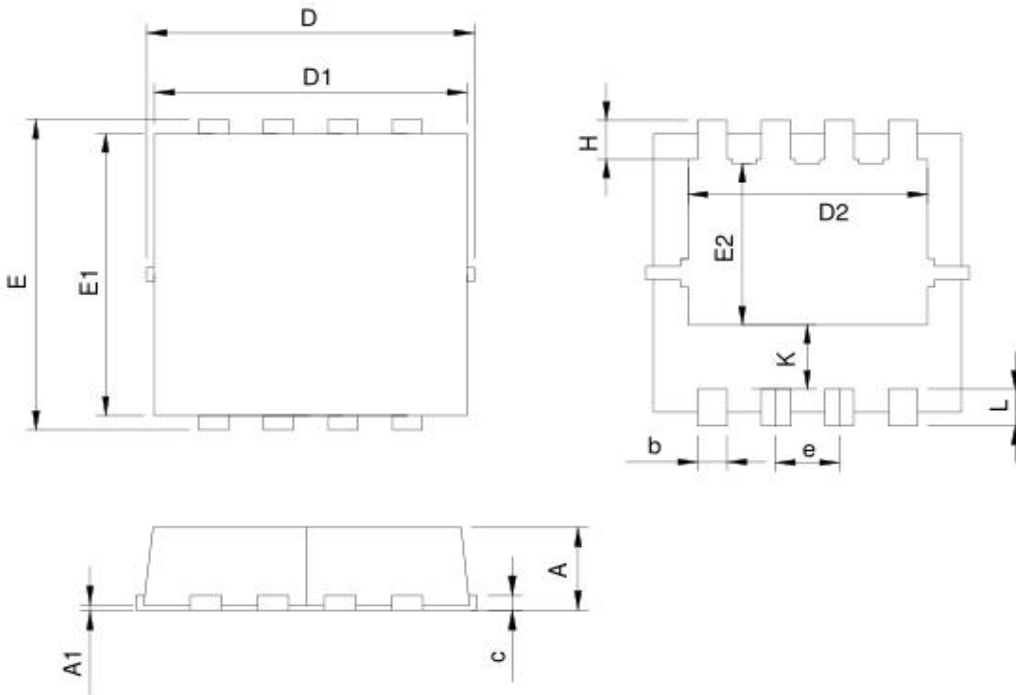


Fig.12 ID vs. Junction Temperature

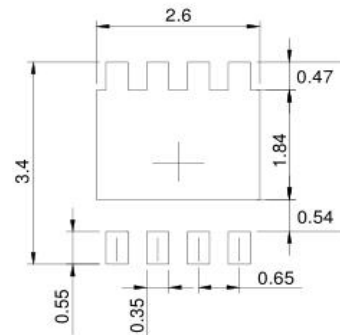


•DFN3\*3 Package Outline



SYMBOL	DFN3.3x3.3-8			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	0.70	1.00	0.028	0.039
A1	0.00	0.05	0.000	0.002
b	0.25	0.35	0.010	0.014
c	0.14	0.20	0.006	0.008
D	3.10	3.50	0.122	0.138
D1	3.05	3.25	0.120	0.128
D2	2.35	2.55	0.093	0.100
E	3.10	3.50	0.122	0.138
E1	2.90	3.10	0.114	0.122
E2	1.64	1.84	0.065	0.072
e	0.65 BSC		0.026 BSC	
H	0.32	0.52	0.013	0.020
K	0.59	0.79	0.023	0.031
L	0.25	0.55	0.010	0.022

RECOMMENDED LAND PATTERN



UNIT: mm

**Note:**

- ① Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate;
- ② 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	2024/9/25	New
B	2025/1/10	Modified ESD level