

40V N-Channel Power SpeedFET

• 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

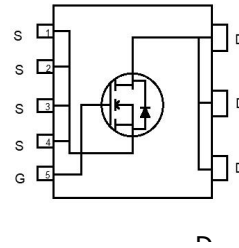
• Ordering Information:

Part NO.	ZMSA010N04HSR
Marking	ZMS010N04H
Packing Information	REEL TAPE
Basic ordering unit (pcs)	2000

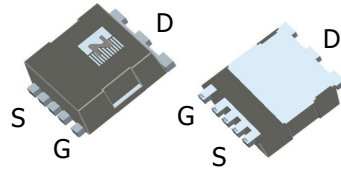
• Absolute Maximum Ratings ( $T_C=25^\circ\text{C}$ )

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	$I_D$	$T_C=25^\circ\text{C}$	260	A
	$I_D$	$T_C=75^\circ\text{C}$	218	A
	$I_D$	$T_C=100^\circ\text{C}$	189	A
Pulsed Drain Current <sup>①</sup>	$I_{DM}$	Pulsed; $t_p \leq 10 \mu\text{s}$ ; $T_{mb} = 25^\circ\text{C}$ ;	780	A
Total Power Dissipation	$P_D$	$T_C=25^\circ\text{C}$	150	W
Total Power Dissipation	$P_D$	$T_A=25^\circ\text{C}$	3.0	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	$E_{AS}$	$L=0.1\text{mH}$ , $V_{GS}=10\text{V}$ , $R_g=25\Omega$ ,	282	mJ
		$L=0.3\text{mH}$ , $V_{GS}=10\text{V}$ , $R_g=25\Omega$ ,	592.2	mJ
ESD Level (HBM)	CLASS 2			

• Product Summary



$V_{DS} = 40\text{V}$   
 $R_{DS(ON)} = 0.85\text{m}\Omega$   
 $I_D = 260\text{A}$



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## •Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	$R_{thJC}$		-	1	°C/W
Thermal resistance, junction-ambient	$R_{thJA②}$		-	50	°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	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	2.0	2.4	4.0	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	$R_{DS(ON)}$	$V_{GS}=10V, I_D=100A$		0.85	1	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_{SD}=10A$		60		S
Diode Forward Voltage	$V_{FSD}$	$V_{GS}=0V, I_{SD}=100A$			1.3	V

## •Dynamic characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	$C_{iss}$	$f=1MHz, V_{DS}=25V$	-	4200	-	pF
Output capacitance	$C_{oss}$		-	1150	-	
Reverse transfer capacitance	$C_{rss}$		-	62	-	
Gate Resistance	$R_g$	$f=1MHz$	-	1.4		$\Omega$
Total gate charge	$Q_g$	$V_{DD}=15V, I_D=20A, V_{GS}=10V$	-	60	-	nC
Gate - Source charge	$Q_{gs}$		-	14	-	
Gate - Drain charge	$Q_{gd}$		-	14	-	
Turn-ON Delay time	$t_{D(on)}$	$V_{GS}=10V, V_{DS}=15V, R_G=3.3\Omega, I_D=20A$	-	10	-	ns
Turn-ON Rise time	$t_r$		-	8	-	ns
Turn-Off Delay time	$t_{D(off)}$		-	25	-	ns
Turn-Off Fall time	$t_f$		-	15	-	ns
Reverse Recovery Time	$t_{RR}$	$V_{DD}=20V, di_s/dt=100A/\mu s, I_S=50A$	-	70	-	ns
Reverse Recovery Charge	$Q_{RR}$		-	85	-	nC

Fig.1 Gate-Charge Characteristics

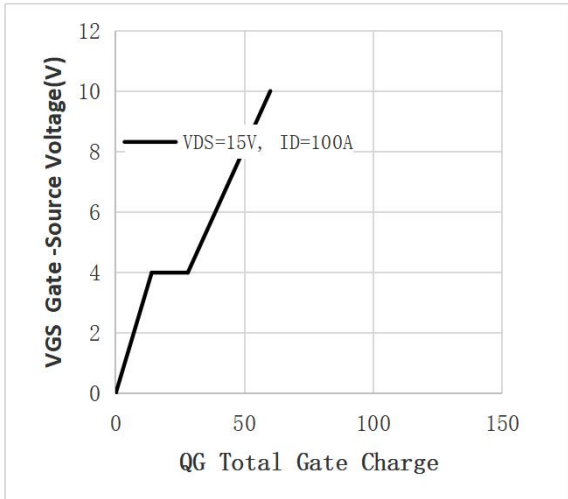


Fig.2 Capacitance Characteristics

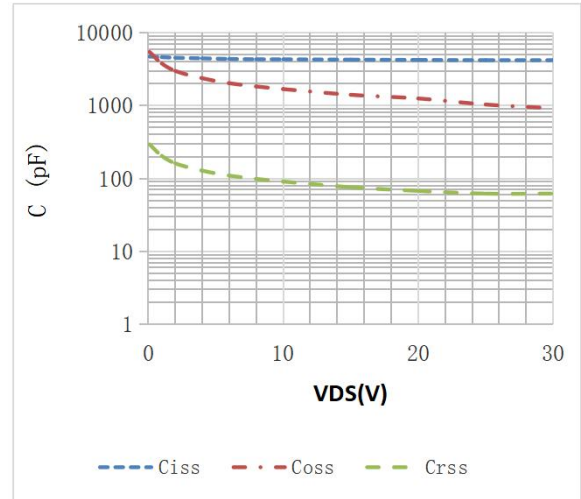


Fig.3 Power Dissipation

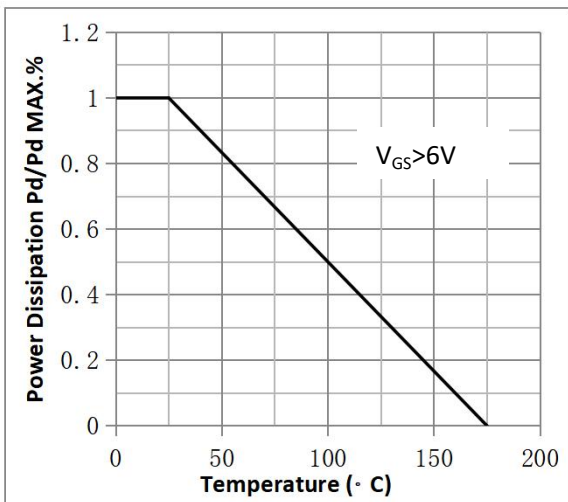


Fig.4 Typical output Characteristics

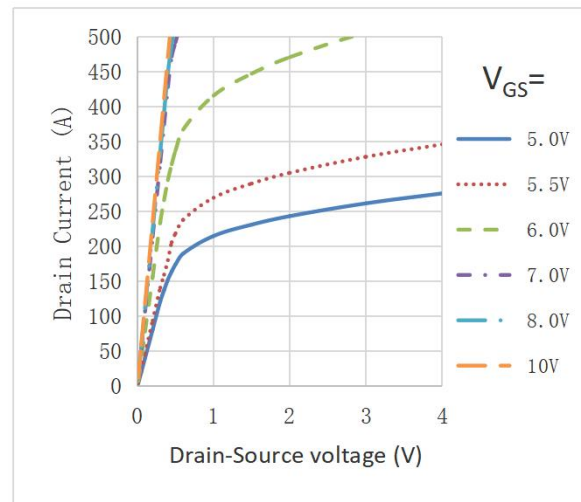


Fig.5 Threshold Voltage V.S Junction Temperature

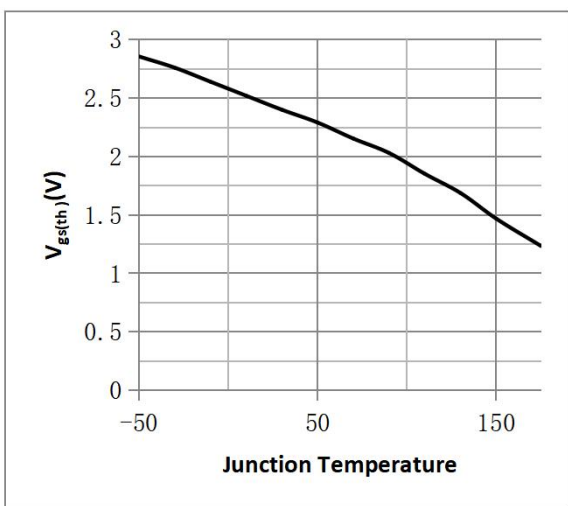


Fig.6 Resistance V.S Drain Current

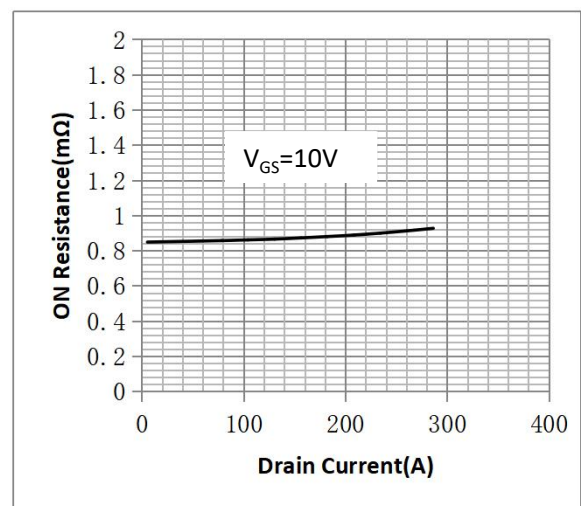


Fig.7 On-Resistance VS Gate Source Voltage

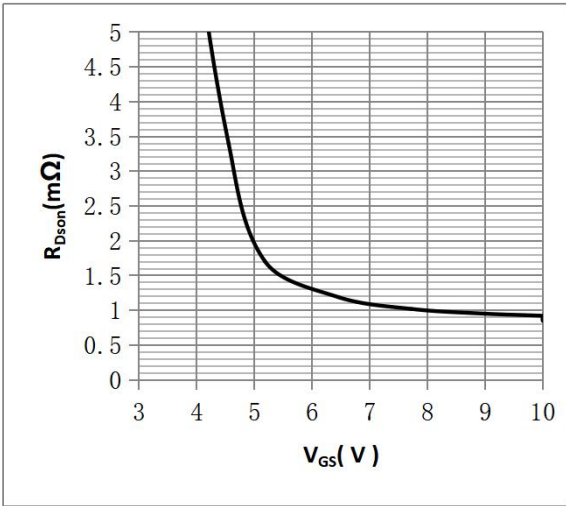


Fig.8 On-Resistance V.S Junction Temperature

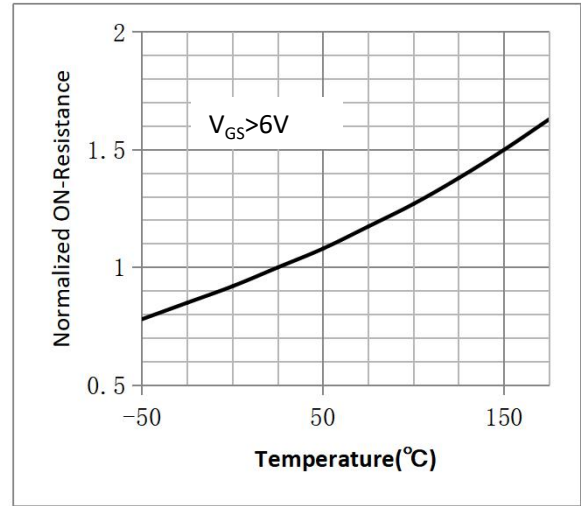


Figure 9. Diode Forward Voltage vs. Current

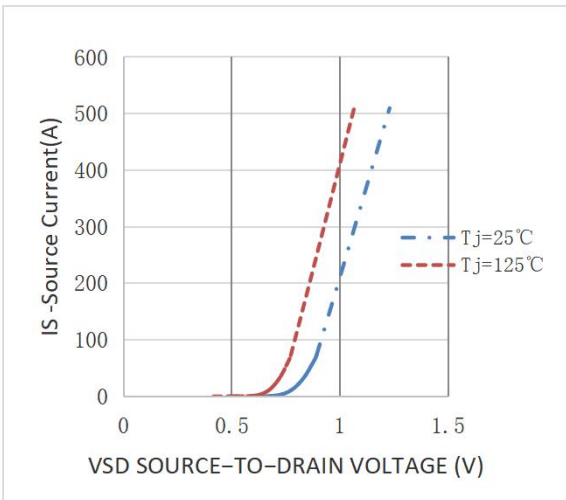


Figure 10. Transfer Characteristics

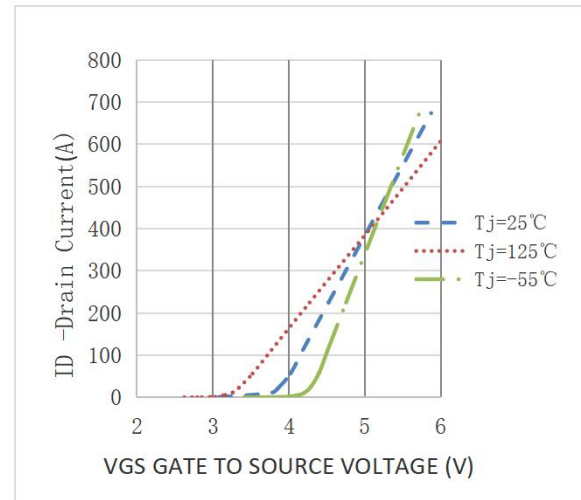


Fig.11 Safe Operating Area

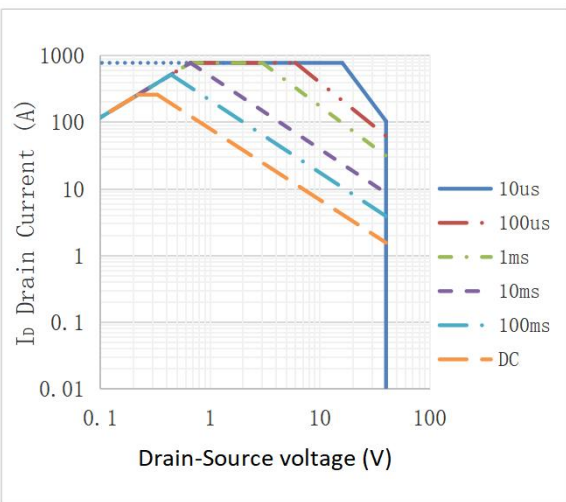
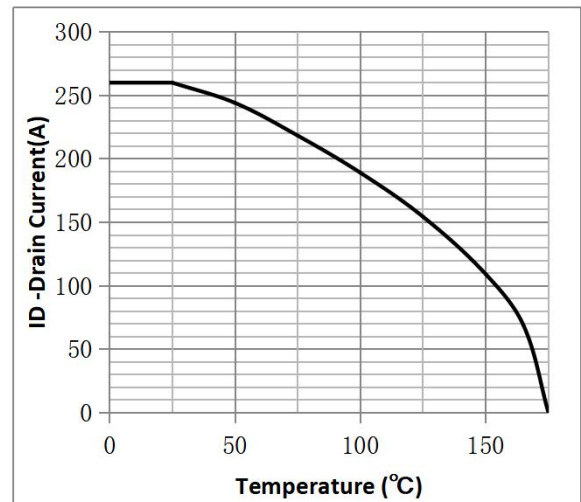
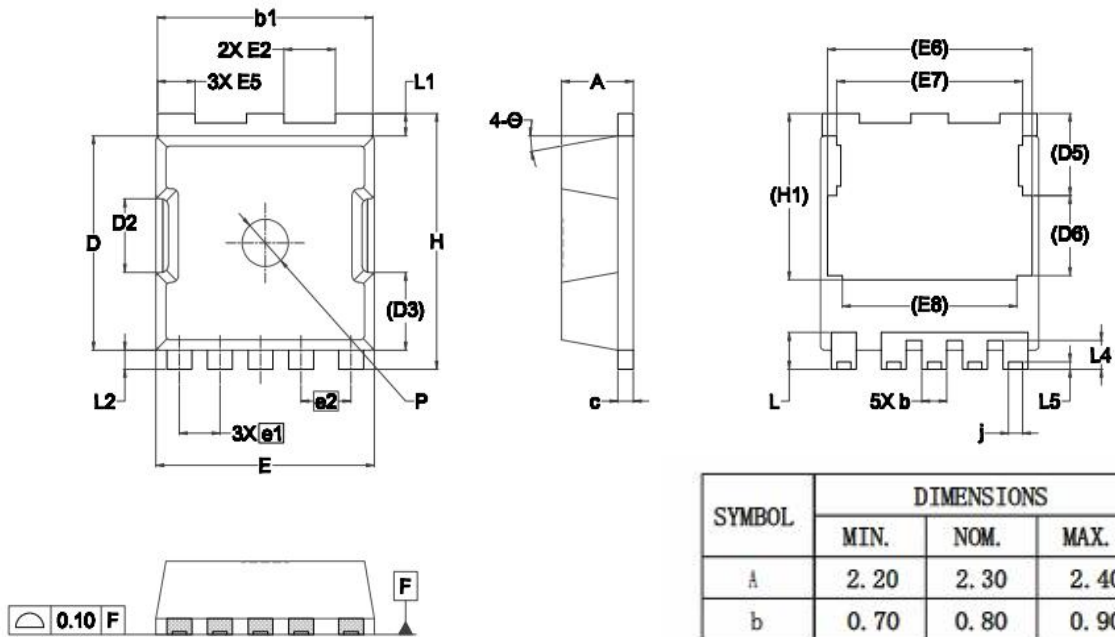


Fig.12 ID vs. Case Temperature<sup>®</sup>



•STOLL Package Outline



SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	2.20	2.30	2.40
b	0.70	0.80	0.90
b1	6.80	6.90	7.00
c	0.40	0.50	0.60
D	6.60	6.70	6.80
D2	2.20	2.30	2.40
D3	2.43REF.		
D5	2.57REF.		
D6	2.50REF.		
E	6.90	7.00	7.10
E2	1.55	1.65	1.75
E5	1.10	1.20	1.30
E6	6.56REF.		
E7	5.96REF.		
E8	5.60REF.		
e1	1.20	1.30	1.40
e2	1.50	1.60	1.70
H	7.80	8.00	8.20
H1	5.20REF.		
L	1.05	1.15	1.25
L1	0.60	0.70	0.80
L2	0.50	0.60	0.70
L4	0.80	0.90	1.00
L5	0.135	0.235	0.335
j	0.42	0.45	0.50
P	1.40	1.50	1.60
e	8.50*	—	11.50*



**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 1 inch square copper plate;
- ③ Practically the current will be limited by PCB, thermal design and operating temperature. V<sub>GS</sub>=10V.

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Revision History

Version	Date	Change
A	2024.1.10	Preliminary