



General Description

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

Features

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

Application

- BLDC Motor driver
- DC-DC
- Load Switch

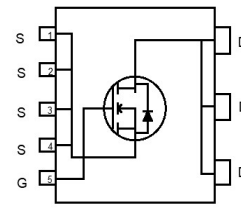
Ordering Information:

Part NO.	ZMSA004N04HSR
Marking	ZMS004N04H
Packing Information	REEL TAPE
Basic ordering unit (pcs)	3000

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

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DS}		40	V
Gate-Source Voltage ^①	V_{GS}		± 20	V
Continuous Drain Current	I_D	$T_C=25^\circ\text{C}$	475	A
	I_D	$T_C=75^\circ\text{C}$	388	A
	I_D	$T_C=100^\circ\text{C}$	336	A
Pulsed Drain Current	I_{DM}	Pulsed; $t_p \leq 10 \mu\text{s}$; $T_{mb} = 25^\circ\text{C}$;	1425	A
Total Power Dissipation	P_D	$T_C=25^\circ\text{C}$	250	W
Total Power Dissipation	P_D	$T_A=25^\circ\text{C}$	4.3	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}	$L=0.1\text{mH}$, $V_{GS}=10\text{V}$, $R_g=25\Omega$,	560	mJ
		$L=0.5\text{mH}$, $V_{GS}=10\text{V}$, $R_g=25\Omega$,	1176	mJ
ESD Level (HBM)	CLASS 2			

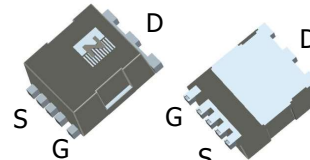
Product Summary



$$V_{DS} = 40\text{V}$$

$$R_{DS(ON)} = 0.45\text{m}\Omega$$

$$I_D = 475\text{A}$$



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•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}		-	0.6	°C/W
Thermal resistance, junction-ambient	$R_{thJA}^{②}$		-	35	°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	2.7	4.0	V
Drain-Source Leakage Current	I_{DSS}	$V_{GS}=0V, V_{DS}=40V$			1.0	μA
Gate- Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$			100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=40A$		0.45	0.65	m Ω
Forward Transconductance	g_{FS}	$V_{GS}=5V, I_{SD}=20A$		60		S
Diode Forward Voltage	V_{FSD}	$V_{GS}=0V, I_{SD}=40A$			1.3	V

•Dynamic characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	C_{iss}	$f=1MHz, V_{DS}=25V$	-	10860	-	pF
Output capacitance	C_{oss}		-	3040	-	
Reverse transfer capacitance	C_{rss}		-	168	-	
Gate Resistance	R_g	$f=1MHz$	-	3.2		Ω
Total gate charge	Q_g	$V_{DD}=15V, I_D=40A, V_{GS}=10V$	-	174	-	nC
Gate - Source charge	Q_{gs}		-	42	-	
Gate - Drain charge	Q_{gd}		-	38	-	
Turn-ON Delay time	$t_{D(on)}$	$V_{GS}=10V, V_{DS}=15V, R_G=3.3\Omega, I_D=20A$	-	75	-	ns
Turn-ON Rise time	t_r		-	78	-	ns
Turn-Off Delay time	$t_{D(off)}$		-	120	-	ns
Turn-Off Fall time	t_f		-	55	-	ns
Reverse Recovery Time	t_{RR}	$V_{DD}=20V, dI_S/dt=100A/\mu s, I_S=50A$	-	96	-	ns
Reverse Recovery Charge	Q_{RR}		-	230	-	nC



Fig.1 Gate-Charge Characteristics

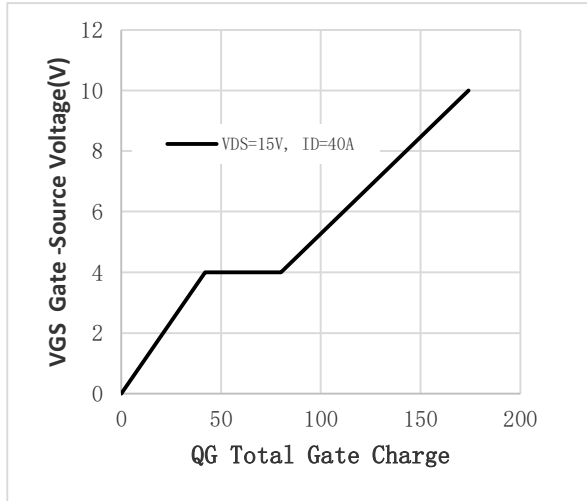


Fig.2 Capacitance Characteristics

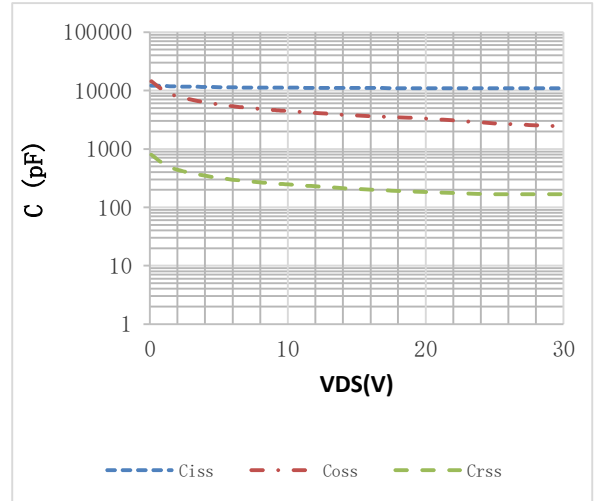


Fig.3 Power Dissipation

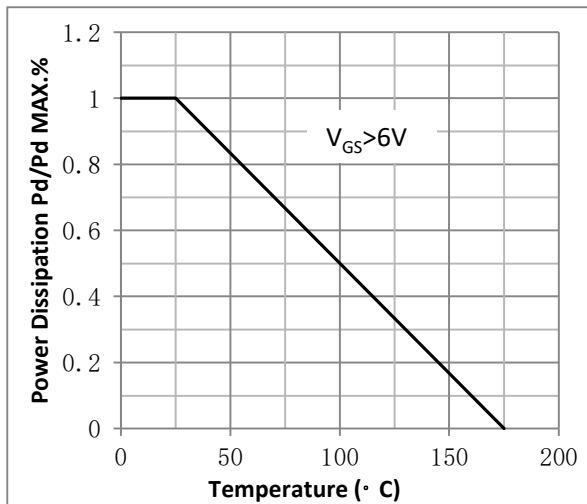


Fig.4 Typical output Characteristics

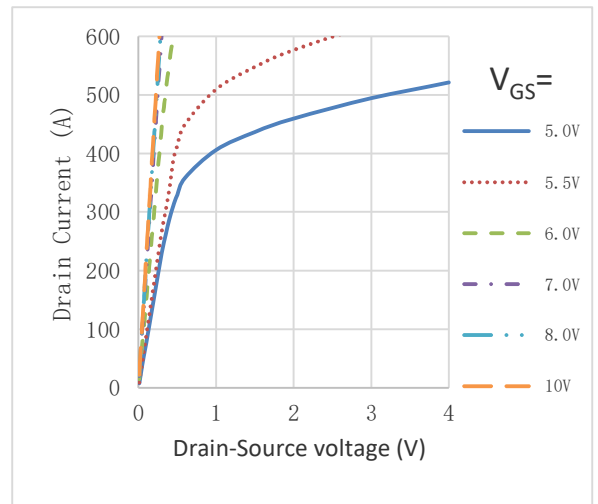


Fig.5 Threshold Voltage V.S Junction Temperature

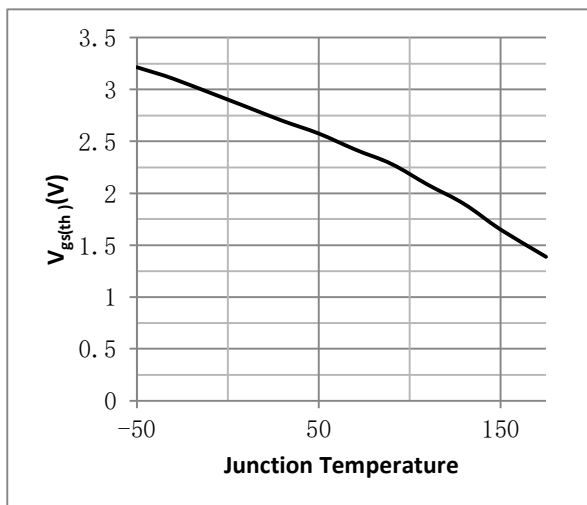


Fig.6 Resistance V.S Drain Current

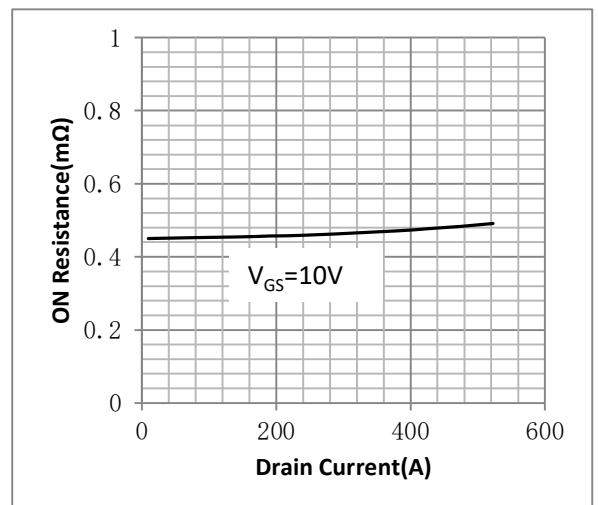




Fig.7 On-Resistance VS Gate Source Voltage

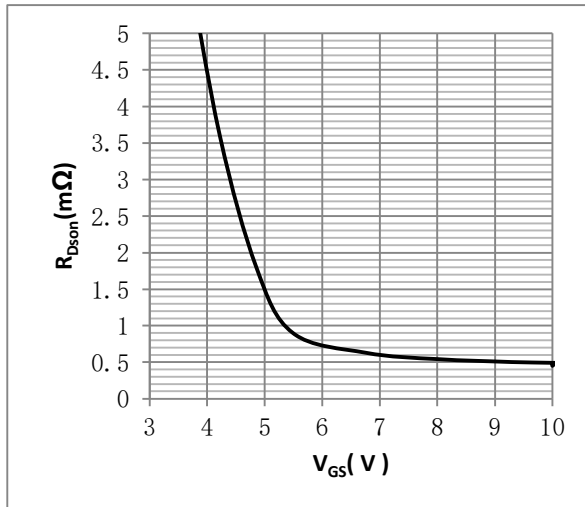


Fig.8 On-Resistance V.S Junction Temperature

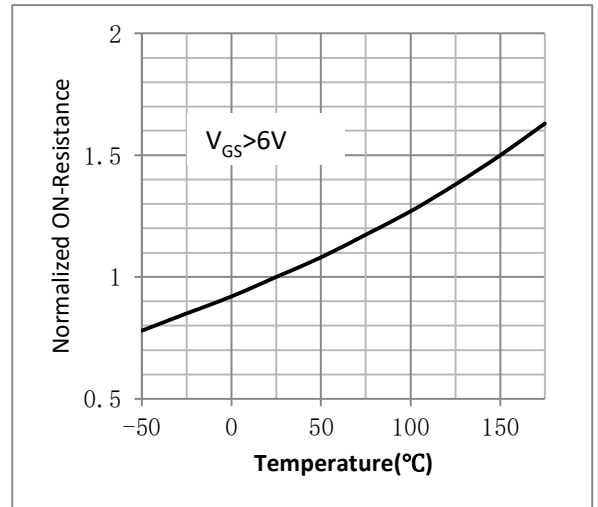


Figure 9. Diode Forward Voltage vs. Current

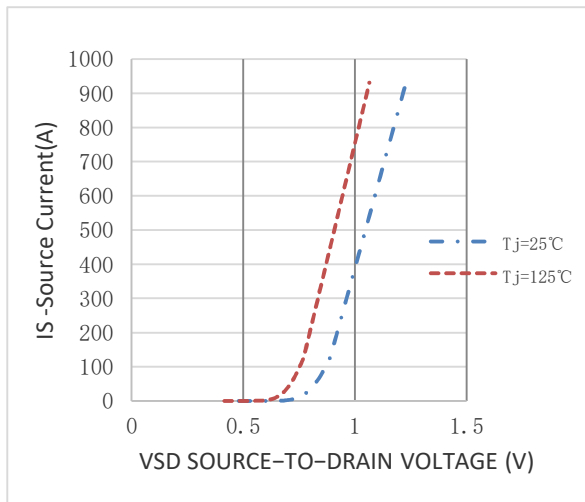


Figure 10. Transfer Characteristics

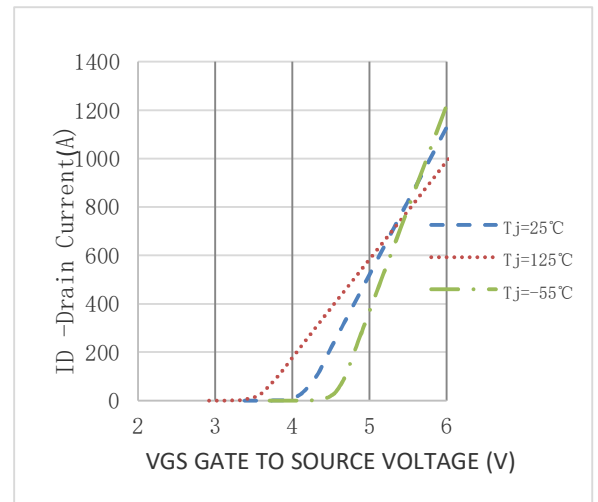
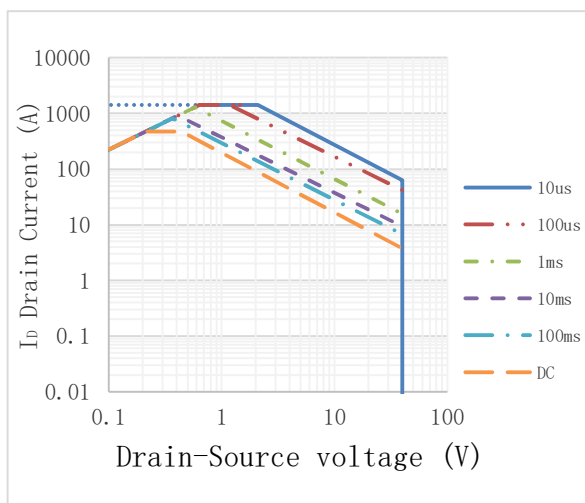
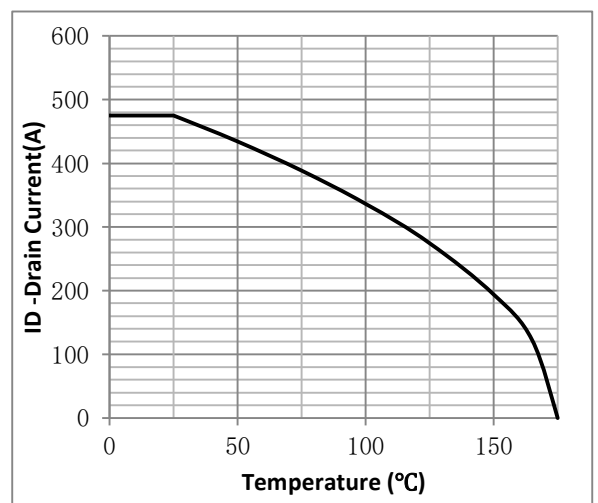
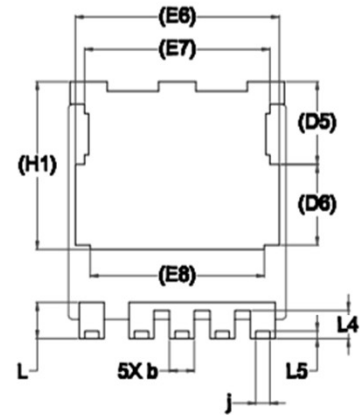
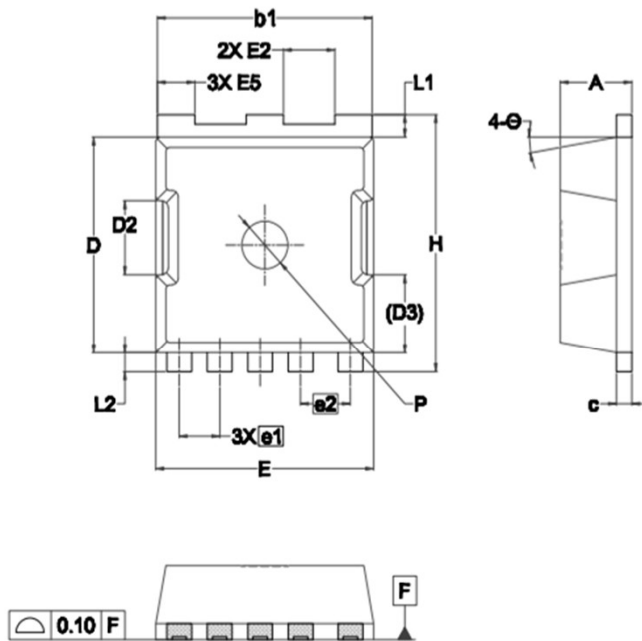


Fig.11 Safe Operating Area

Fig.12 ID vs. Case Temperature^③



•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 : $V_{GS}=+20V/-20V$, 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	2024.5.6	New
B	2025.10.28	Modify features.