

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

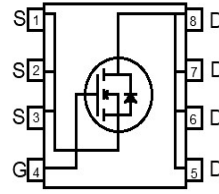
Ordering Information:

Part NO.	ZMSA012N04HNCD
Marking	ZMS012N04H
Packing Information	REEL TAPE
Basic ordering unit (pcs)	3000

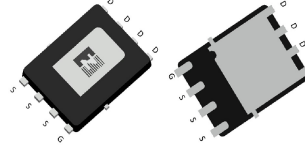
Absolute Maximum Ratings ($T_A=25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Max.	Unit
Drain-Source Voltage	V_{DS}		-	40	V
Gate-Source Voltage ^①	V_{GS}		-20	20	V
Continuous Drain Current	I_D	$V_{GS}=10\text{V}, T_C=25^\circ\text{C}$	-	310	A
	I_D	$V_{GS}=10\text{V}, T_C=75^\circ\text{C}$	-	262	A
	I_D	$V_{GS}=10\text{V}, T_C=100^\circ\text{C}$	-	227	A
Pulsed Drain Current ^①	I_{DM}	Pulsed; $t_p \leq 10 \mu\text{s}; T_C = 25^\circ\text{C};$	-	1240	A
Total Power Dissipation	P_D	$T_C=25^\circ\text{C}$	-	294	W
Total Power Dissipation	P_D	$T_A=25^\circ\text{C}$	-	3.3	W
Operating Junction Temperature	T_J		-55	175	$^\circ\text{C}$
Storage Temperature	T_{STG}		-55	175	$^\circ\text{C}$
Single Pulse Avalanche Energy	E_{AS}	$L=0.1\text{mH}, V_{GS}=10\text{V}, R_g=25\Omega,$	-	211	mJ
		$L=0.3\text{mH}, V_{GS}=10\text{V}, R_g=25\Omega,$	-	338	mJ
ESD Level (HBM)	CLASS 2				

Product Summary



$V_{DS} = 40\text{V}$
 $R_{DS(ON)} = 1.3\text{m}\Omega$
 $I_D = 310\text{A}$



DSCQFN5*6



•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}	-	-	0.51	°C/W
Thermal resistance, junction-ambient	$R_{thJA}^{②}$	-	-	45	°C/W
Soldering temperature	T_{sold}	-	-	260	°C

•Electronic Characteristics (Tj=25°C,unless otherwise specified)

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	2.7	4	V
Drain-Source Leakage Current	I_{DSS}	$V_{GS}=0V, V_{DS}=40V$	-	-	1	μA
Gate- Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=30A, T_j=25^\circ C$	-	1.3	1.55	m Ω
		$V_{GS}=10V, I_D=30A, T_j=175^\circ C$	-	2.4	-	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_{SD}=5A$	-	23	-	S
Diode Forward Voltage	V_{FSD}	$V_{GS}=0V, I_{SD}=30A$	-	-	1.3	V

•Dynamic characteristics (Tj=25°C,unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	C_{iss}	$f=1MHz, V_{DS}=25V, V_{GS}=0V$	-	3314	-	pF
Output capacitance	C_{oss}		-	1000	-	
Reverse transfer capacitance	C_{rss}		-	73	-	
Gate Resistance	R_g	$f=1MHz$	-	2.1	-	Ω
Total gate charge	Q_g	$V_{DD}=25V, I_D=30A, V_{GS}=10V$	-	57.1	-	nC
Gate - Source charge	Q_{gs}		-	12.3	-	
Gate - Drain charge	Q_{gd}		-	16	-	
Turn-ON Delay time	$t_{D(on)}$	$V_{GS}=10V, V_{DS}=20V, R_G=3.3\Omega, I_D=30A$	-	10	-	ns
Turn-ON Rise time	t_r		-	9	-	ns
Turn-Off Delay time	$t_{D(off)}$		-	16	-	ns
Turn-Off Fall time	t_f		-	12	-	ns
Reverse Recovery Time	t_{rr}	$V_{DD}=30V, di_S/dt=100A/\mu s, I_S=30A$	-	52	-	ns
Reverse Recovery Charge	Q_{rr}		-	61	-	nC

Fig.1 Gate-source voltage as a function of gate charge; Typical values; $T_j=25^\circ\text{C}$

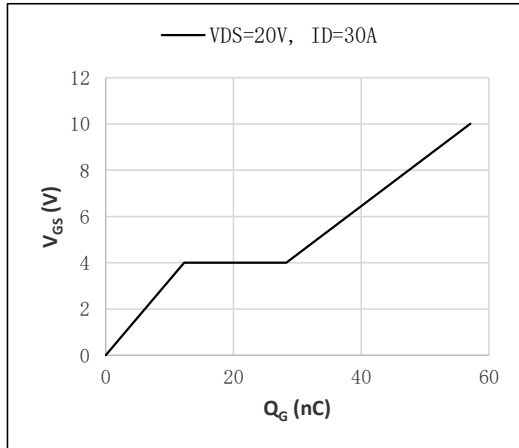


Fig.2 Input, output and reverse transfer capacitances as a function of drain-source voltage; Typical values; $T_j=25^\circ\text{C}$

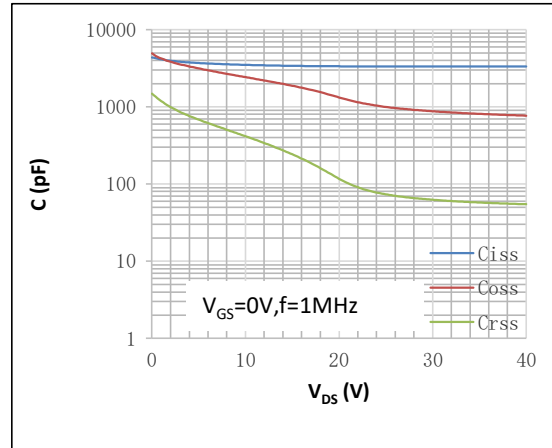


Fig.3 Output characteristics: drain current as a function of drain-source voltage; Typical values; $T_j=25^\circ\text{C}$

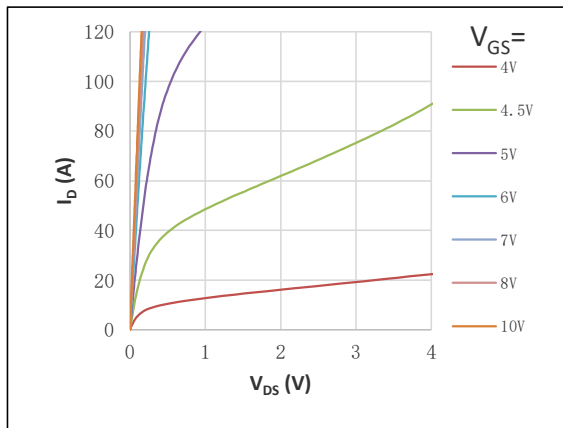


Fig.4 Output characteristics: drain current as a function of drain-source voltage; Typical values: Expanded curve; $T_j=25^\circ\text{C}$

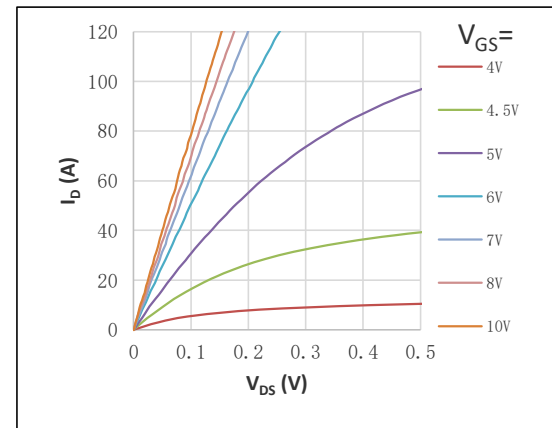


Fig.5 Gate-source threshold voltage as a function of junction temperature; Typical values

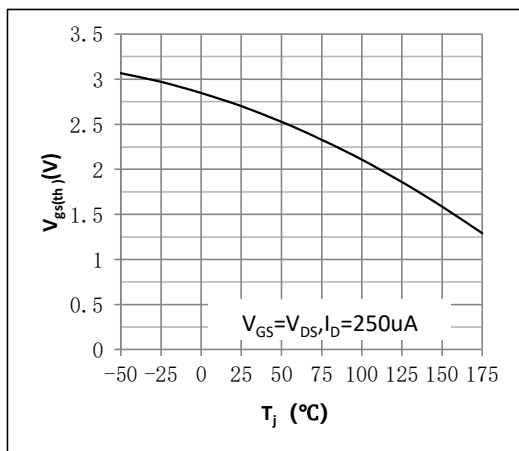


Fig.6 Drain-source on-state resistance as a function of drain current; Typical values; $T_j=25^\circ\text{C}$

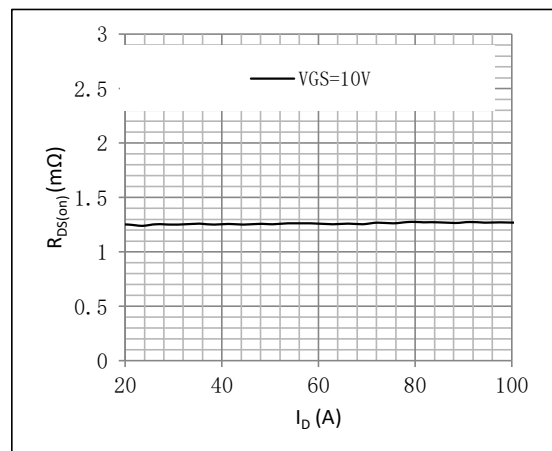


Fig.7 Drain-source on-state resistance as a function of gate-source voltage;Typical values

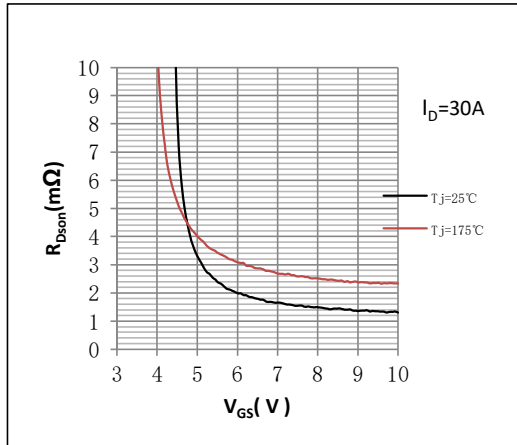


Fig.8 Normalized drain-source on-state resistance factor as a function of junction temperature;Typical values
Normalized On-Resistance= $R_{DS(on)}/R_{DS(on)}(25^{\circ}\text{C})$

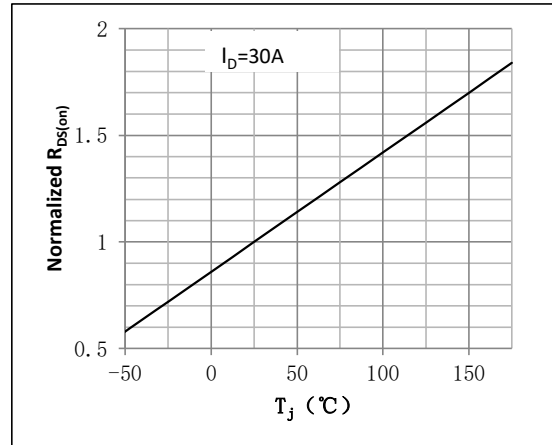


Figure 9. Source (diode forward) current as a function of source-drain (diode forward) voltage ;Typical values

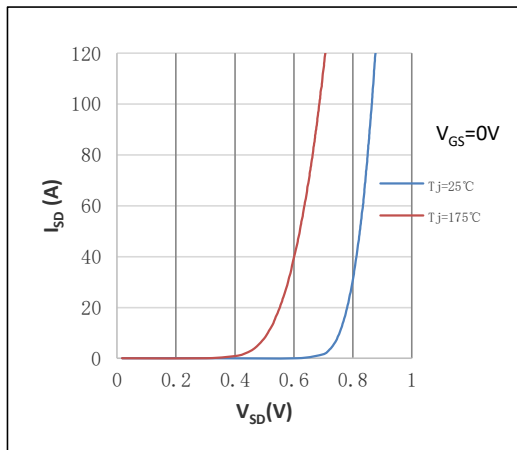


Figure 10. Transfer characteristics: drain current as a function of gate-source voltage;Typical values

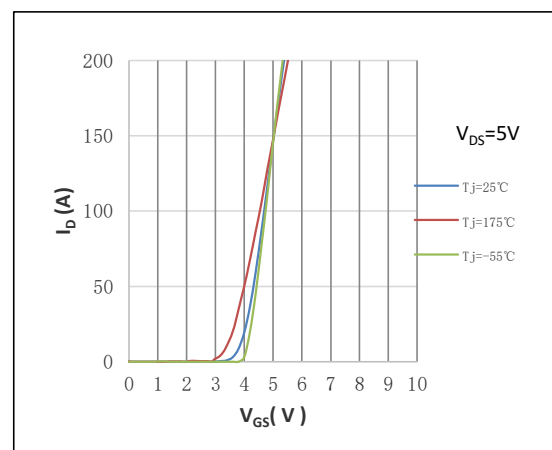


Fig.11 Safe operating area: continuous and peak drain currents as a function of drain-source voltage;Calculative values

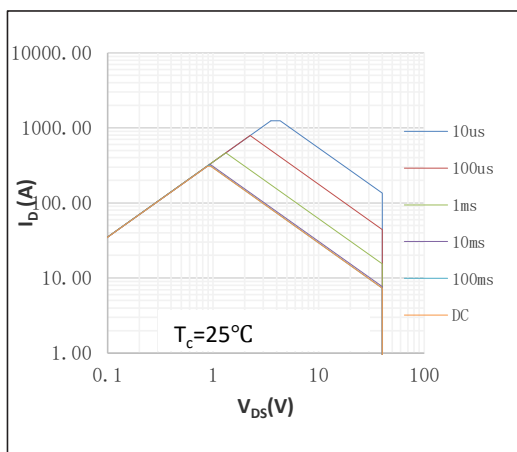


Fig.12 Continuous drain current as a function of case temperature[®];Calculative values

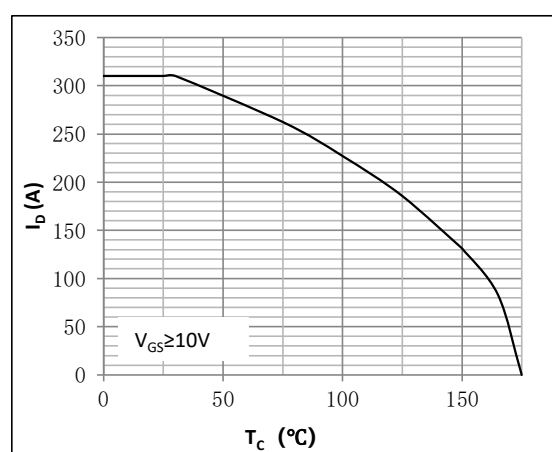


Fig.13 Drain-source breakdown voltage as a function of junction temperature; Typical values
Normalized BVDSS=BVDSS/BVDSS(25°C)

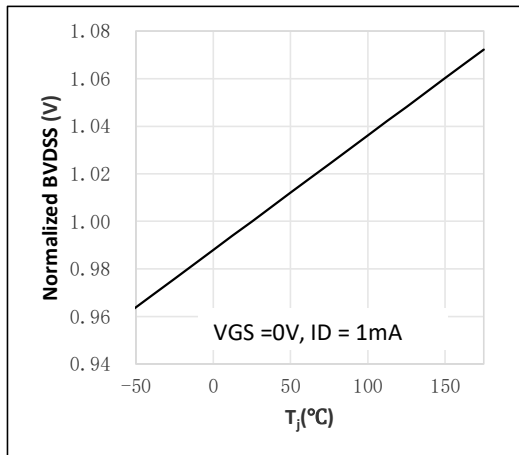


Fig.14 Normalized total power dissipation as a function of case temperature; Calculative values
Normalized Power Dissipation= $P_d/P_d(25^\circ C)$

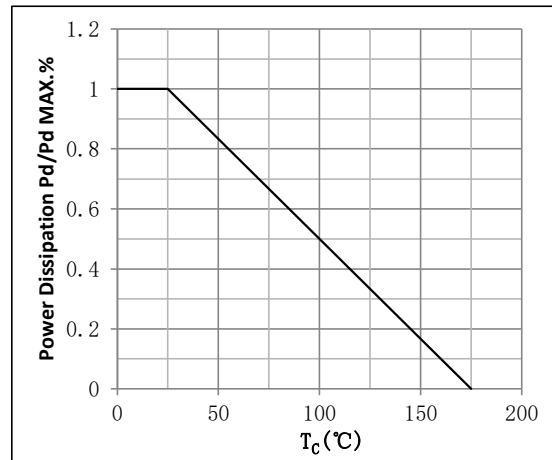
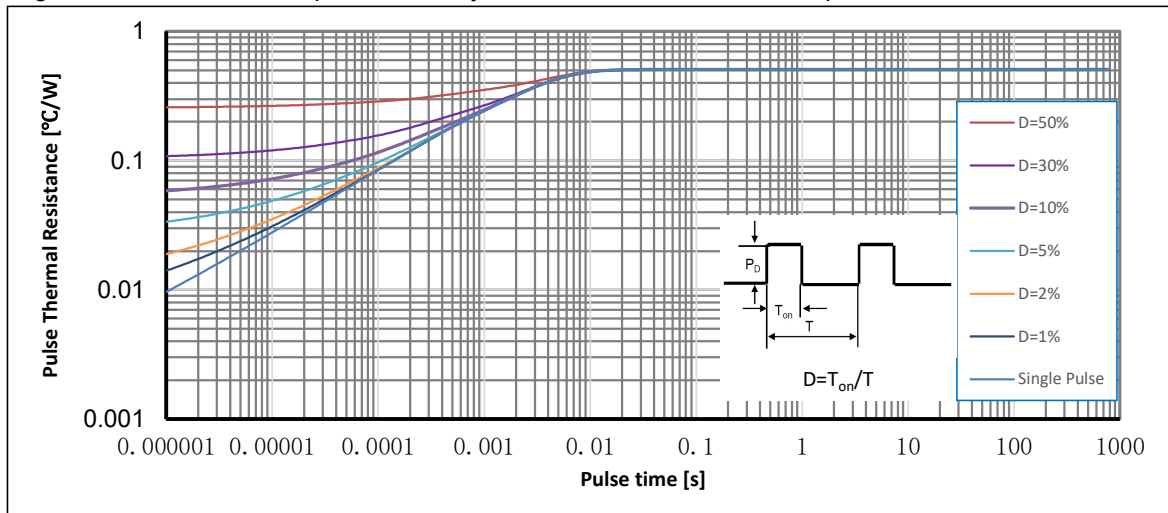
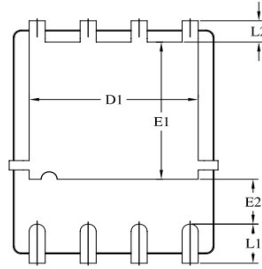
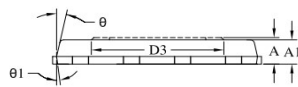
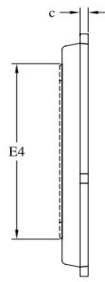
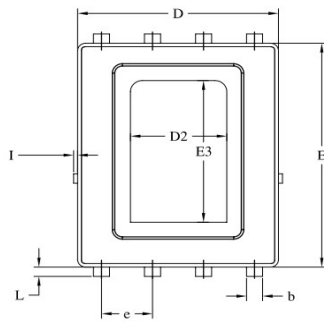


Fig.15 Transient thermal impedance from junction to case as a function of pulse duration; max values



•DSCQFN5*6 Package Outline



S Y M B O L	COMMON		
	MIN.	Nom.	MAX.
A	0.660	0.710	0.760
A1	0.600	-----	0.750
b	0.330	0.430	0.530
c	0.150	0.203	0.300
D	5.00 Bsc.		
D1	4.060	4.210	4.360
D2	2.400 Bsc.		
D3	2.800	3.300	3.800
E	6.00 Bsc.		
E1	3.525	3.675	3.825
E2	1.050	1.200	1.350
E3	3.800 Bsc.		
E4	4.200	4.700	5.200
e	1.270 Bsc.		
I	-----	-----	0.150
L	0.150	0.250	0.350
L1	0.925	1.050	1.175
L2	0.450	0.575	0.700
theta	12° Bsc.		
theta 1	7° Bsc.		

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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Version	Date	Change
A	2025/5/14	New