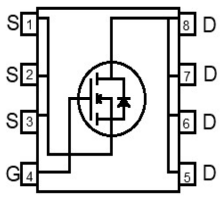
40V N-Channel Power SpeedFET

• General Description

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

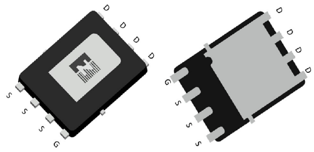
• Product Summary



V_{DS}= 40V

$R_{DS(ON)}$ = 1.3mΩ

I_D= 310A



DSCQFN5*6

• 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°C,unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Max.	Unit
Drain-Source Voltage	V_{DS}		-	40	V
Gate-Source Voltage①	V_{GS}		-20	20	V
Continuous Drain Current	I_D	V_{GS}=10V,T_C=25℃	-	310	A
	I_D	V_{GS}=10V,T_C=75°C	-	262	A
	I_D	V_{GS}=10V,T_C=100°C	-	227	A
Pulsed Drain Current ①	I_{DM}	Pulsed; t_p ≤ 10 μs; T_C = 25 °C;	-	1240	A
Total Power Dissipation	P_D	T_C=25℃	-	294	W
Total Power Dissipation	P_D	T_A=25℃	-	3.3	W
Operating Junction Temperature	T_J		-55	175	℃
Storage Temperature	T_{STG}		-55	175	℃
Single Pulse Avalanche Energy	E_{AS}	L=0.1mH, V_{GS}=10V, Rg=25Ω,	-	211	mJ
		L=0.3mH, V_{GS}=10V, Rg=25Ω,	-	338	mJ
ESD Level (HBM)	CLASS 2				

•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	Tsold	-	-	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 =250uA	40	-	-	V
Gate Threshold Voltage	$VGS_{(TH)}$	V_{GS}=V_{DS}, I_D=250uA	2	2.7	4	V
Drain-Source Leakage Current	I_{DSS}	V_{GS}=0V, V_{DS}=40V	-	-	1	uA
Gate- Source Leakage Current	I_{GSS}	V_{GS}=±20V, V_{DS} = 0V	-	-	100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=30A, Tj=25°C	-	1.3	1.55	mΩ
		V_{GS}=10V, I_D=30A, Tj=175°C	-	2.4	-	mΩ
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	Ciss	f = 1MHz, V_{DS}=25V, V_{GS}=0V	-	3314	-	pF
Output capacitance	Coss		-	1000	-	
Reverse transfer capacitance	Crss		-	73	-	
Gate Risistance	Rg	f = 1MHz	-	2.1	-	Ω
Total gate charge	Qg	V_{DD} = 25V,I_D = 30A, V_{GS} = 10V	-	57.1	-	nC
Gate - Source charge	Qgs		-	12.3	-	
Gate - Drain charge	Qgd		-	16	-	
Turn-ON Delay time	$t_{D(on)}$	V_{GS}=10V,V_{DS}=20V,R_G =3.3 Ω, 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/us, 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;Tj=25°C

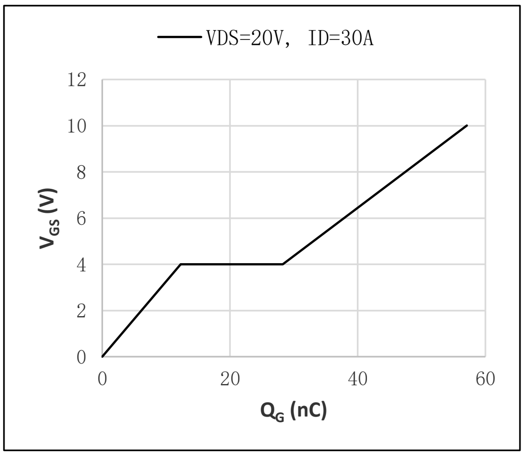


Fig.2 Input, output and reverse transfer capacitances as a function of drain-source voltage;Typical values;Tj=25°C

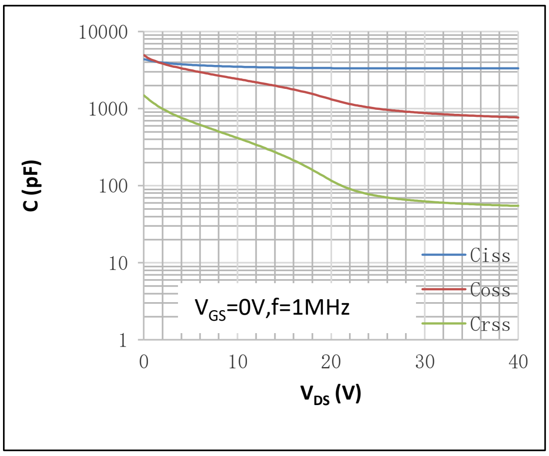


Fig.3 Output characteristics: drain current as a function of drain-source voltage;Typical values; Tj=25°C

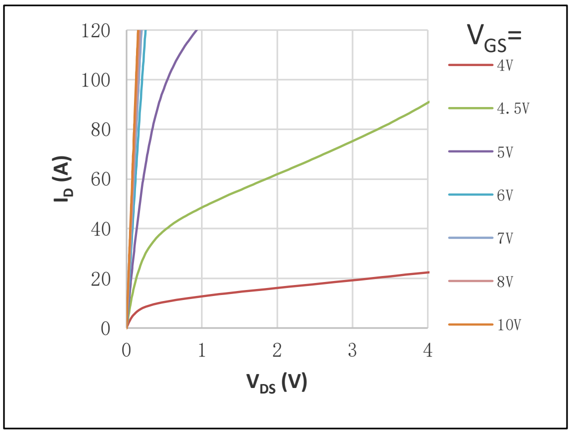


Fig.4 Output characteristics: drain current as a function of drain-source voltage;Typical values:Expanded curve;Tj=25°C

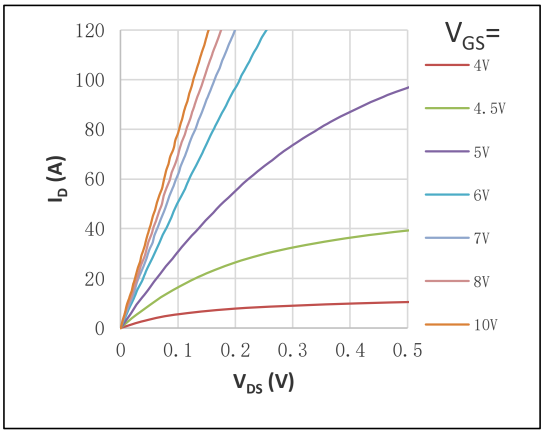


Fig.5 Gate-source threshold voltage as a function of junction temperature;Typical values

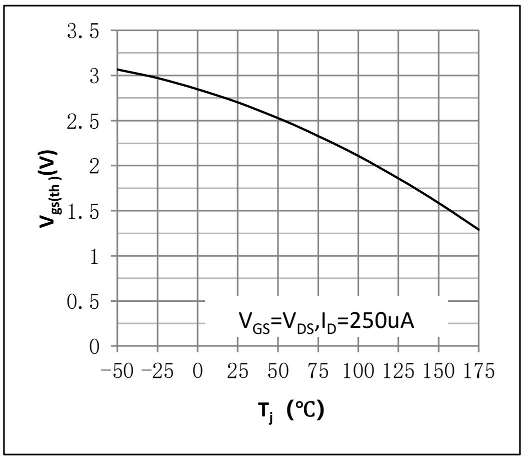


Fig.6 Drain-source on-state resistance as a function of drain current;Typical values;Tj=25°C

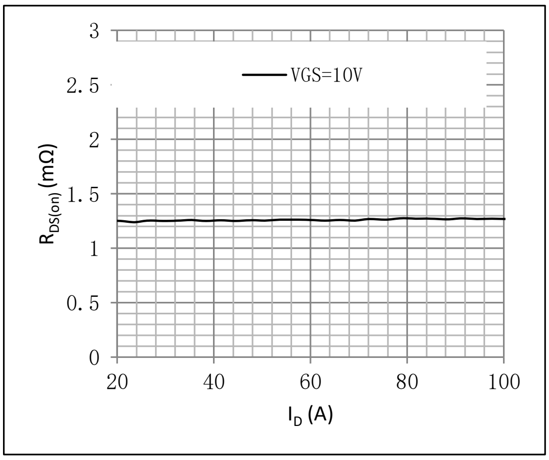


Fig.7 Drain-source on-state resistance as a function of gate-source voltage;Typical values

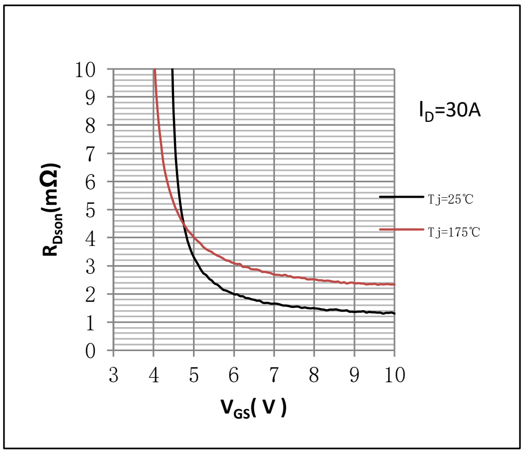


Fig.8 Normalized drain-source on-state resistance factor as a function of junction temperature;Typical values
Normalized On-Resistance=RDSon/RDSon(25 ℃)

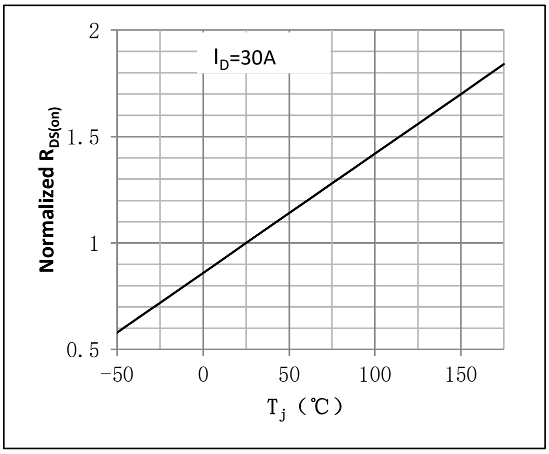


Figure 9. Source (diode forward) current as a function of source-drain (diode forward) voltage ;Typical values

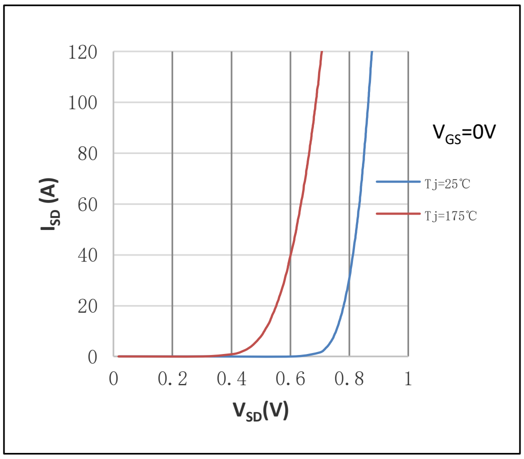


Figure 10. Transfer characteristics: drain current as a function of gate-source voltage;Typical values

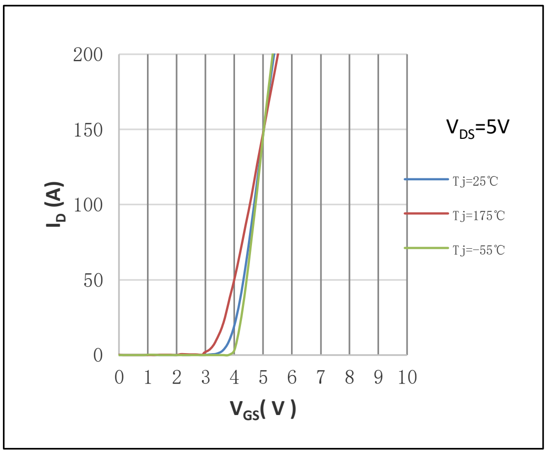


Fig.11 Safe operating area: continuous and peak drain currents as a function of drain-source voltage;Calculative values

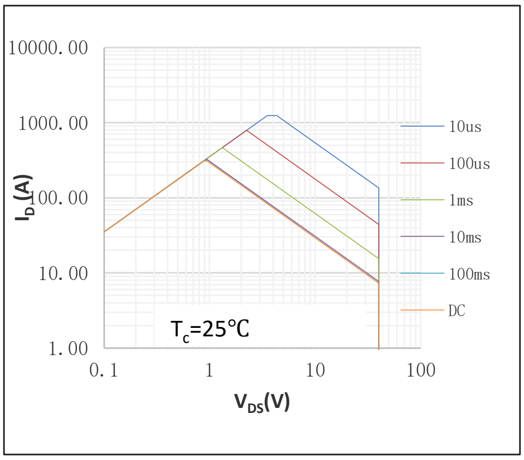


Fig.12 Continuous drain current as a function of case temperaturease[③];Calculative values

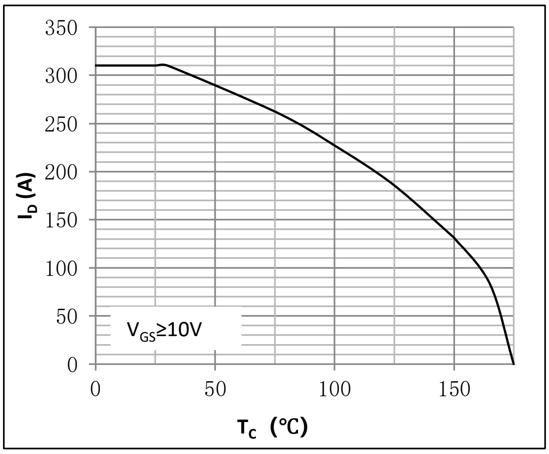


Fig.13 Drain-source breakdown voltage as a function of junction temperature;Typical values
Normalized BVDSS=BVDSS/BVDSS(25°C)

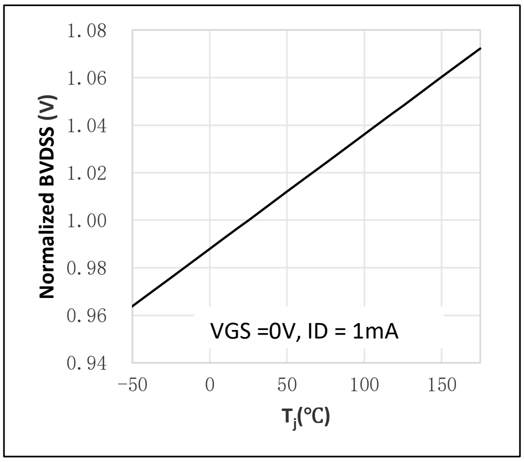


Fig.14 Normalized total power dissipation as a function of case temperature;Calculative values
Normalized Power Dissipation=Pd/Pd(25°C)

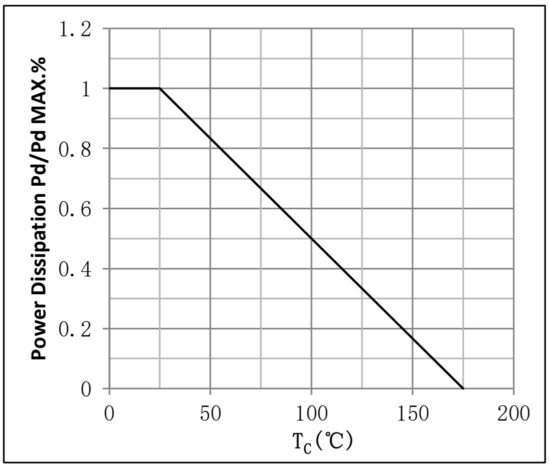
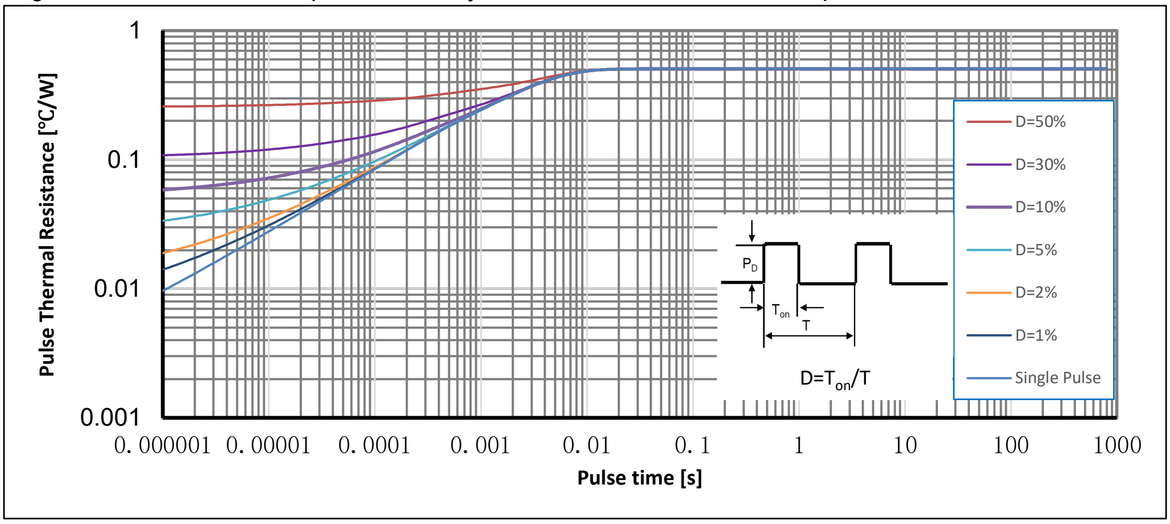
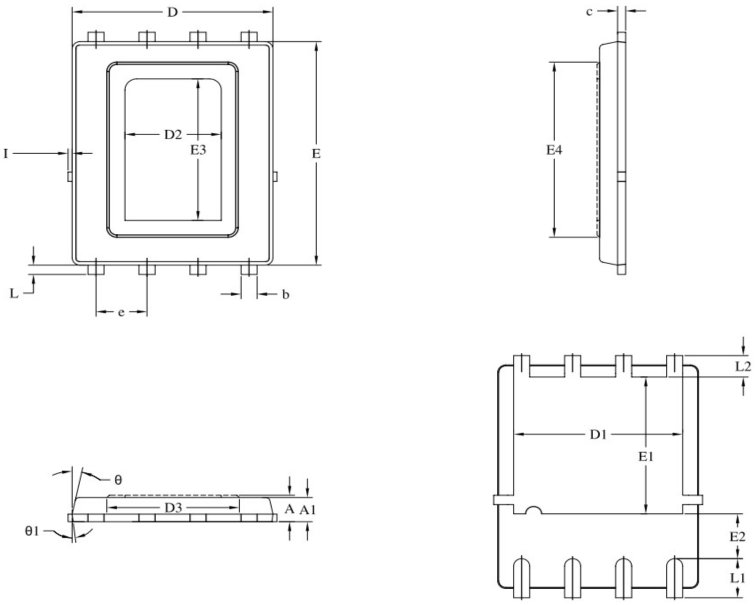


Fig.15 Transient thermal impedance from junction to case as a function of pulse duration; max values



●DSCQFN5*6 Package Outline



SYMBOL	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
θ	12° Bsc.		
θ1	7° Bsc.		

Note:

① Pulse : VGS=+20V/-20V, Duty cycle=50%,Tj=175℃, t=1000 hours; For DC ， the following test conditions can be passed: VGS=+20V/-10V, Tj=175℃, t=1000 hours；

② Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate；

③Practically the current will be limited by PCB, thermal design and operating temperature. VGS=10V.

Disclaimer

Version	Date	Change
A	2025/5/14	New