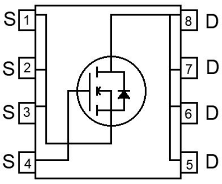
60V N-Channel Power SpeedFET

• General Description

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

• Product Summary



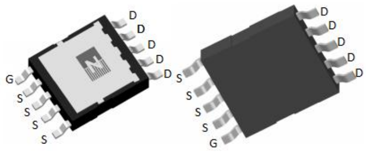
V_{DS}= 60V

$R_{DS(ON)}$ = 1.2mΩ

I_D= 229A

• Features

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



DFN5*7

•Application

- ■BLDC Motor driver
- ■DC-DC
- ■Battery protection

•Ordering Information:

Part NO.	ZMSA012N06HTNC
Marking	ZMS012N06H
Packing Information	REEL TAPE
Basic ordering unit (pcs)	3000

•Absolute Maximum Ratings (T_C=25℃)

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DS}		60	V
Gate-Source Voltage①	V_{GS}		±20	V
Continuous Drain Current	I_D	T_C=25℃	229	A
	I_D	T_C=75℃	187	A
	I_D	T_C=100℃	162	A
Pulsed Drain Current	I_{DM}	Pulsed; t_p ≤ 10 μs; T_{mb} = 25 °C;	687	A
Total Power Dissipation	P_D	T_C=25℃	176	W
Total Power Dissipation	P_D	T_A=25℃	3.3	W
Operating Junction Temperature	T_J		-55 to +175	℃
Storage Temperature	T_{STG}		-55 to +175	℃
Single Pulse Avalanche Energy	E_{AS}	L=0.1mH, V_{GS}=10V, Rg=25Ω,	320	mJ
		L=0.5mH, V_{GS}=10V, Rg=25Ω,	460	mJ
ESD Level (HBM)			CLASS 2	

•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}		-	0.85	°C/W
Thermal resistance, junction-ambient	R_{thJA} ②		-	45	°C/W
Soldering temperature (total time<10s)	Tsold		-	260	°C

•Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS} =0V, I_D =250uA	60			V
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} =V_{DS}, I_D =250uA	2.0	2.7	4.0	V
Drain-Source Leakage Current	I_{DSS}	V_{GS}=0V, V_{DS}= 60V			1.0	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= 40A		1.2	1.6	mΩ
Forward Transconductance	g_{FS}	V_{DS} =5V, I_{SD} = 10A		15		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	Ciss	f = 1MHz, V_{DS}=25V	-	4950	6435	pF
Output capacitance	Coss		-	1800	2340	
Reverse transfer capacitance	Crss		-	72	94	
Gate Risistance	Rg	f = 1MHz	-	1.6	2.7	Ω
Total gate charge	Qg	V_{DD} = 15V, I_D = 20A, V_{GS} = 10V	-	67	87	nC
Gate - Source charge	Qgs		-	17	22	
Gate - Drain charge	Qgd		-	14	18	
Turn-ON Delay time	$t_{D(on)}$	V_{GS}=10V,V_{DS}=15V, R_G =3.3Ω, I_D =20A	-	15	19.5	ns
Turn-ON Rise time	t_r		-	10	13	ns
Turn-Off Delay time	$t_{D(off)}$		-	26	34	ns
Turn-Off Fall time	t_f		-	17	22	ns
Reverse Recovery Time	t_{RR}	V_{DD}=20V, dI_S/dt = 100A/us, I_S=50A	-	48	62	ns
Reverse Recovery Charge	Q_{RR}		-	47	61	nC

Fig.1 Gate-Charge Characteristics

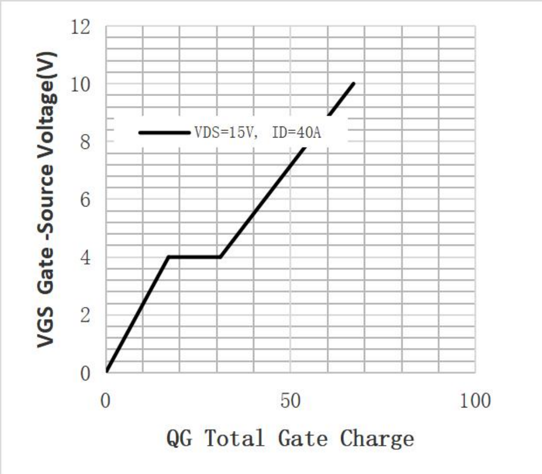


Fig.2 Capacitance Characteristics

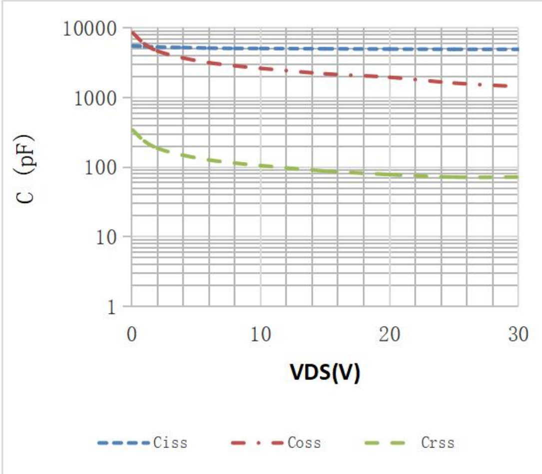


Fig.3 Power Dissipation

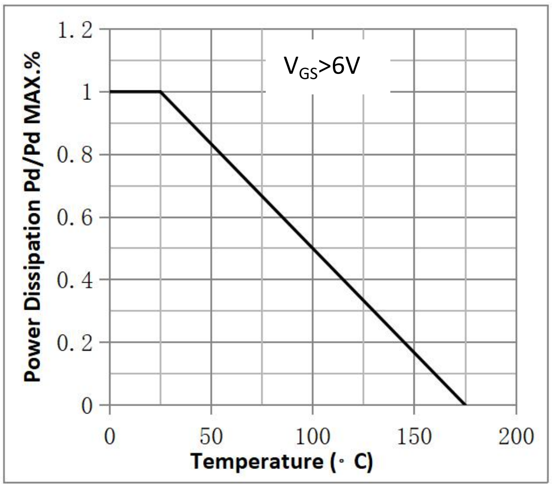


Fig.4 Typical output Characteristics

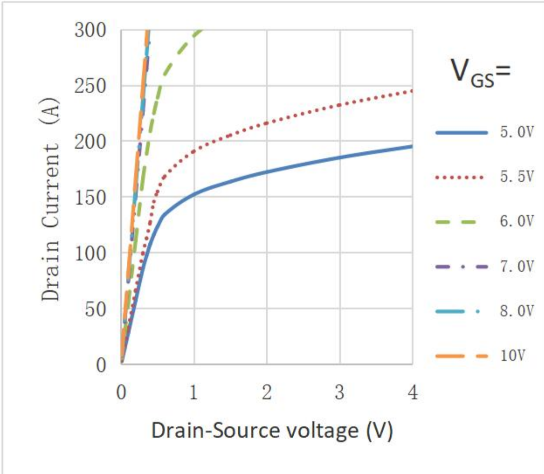


Fig.5 Threshold Voltage V.S Junction Temperature

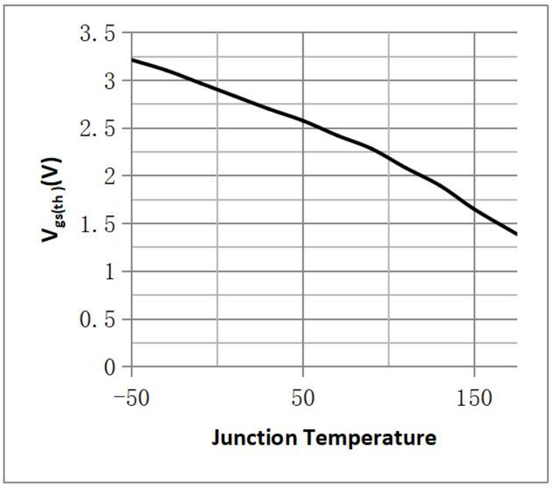


Fig.6 Resistance V.S Drain Current

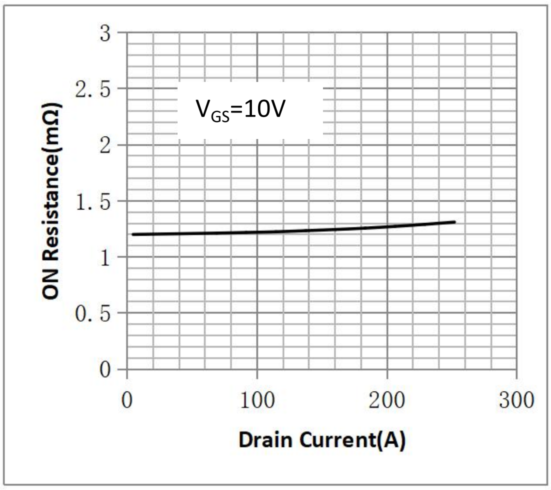


Fig.7 On-Resistance VS Gate Source Voltage

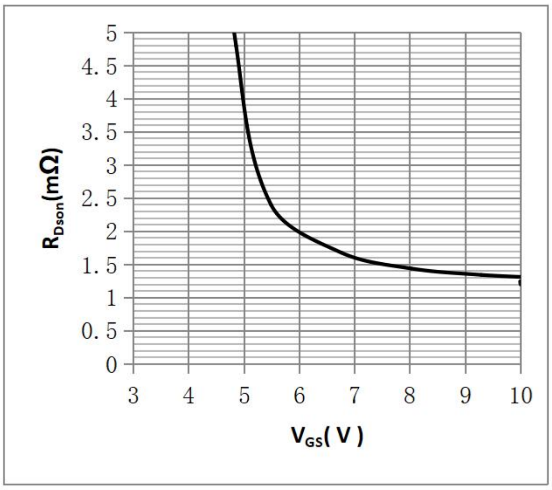


Fig.8 On-Resistance V.S Junction Temperature

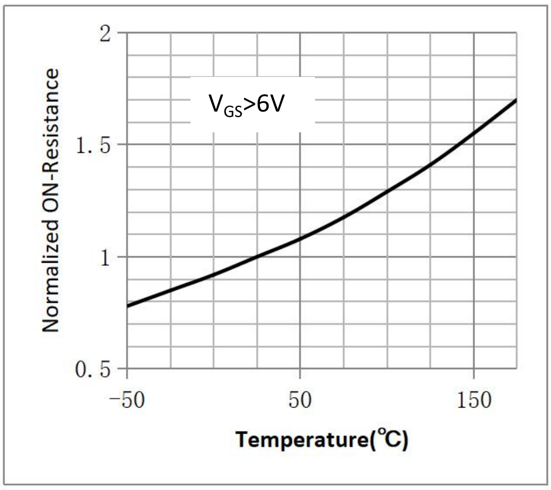


Figure 9. Diode Forward Voltage vs. Current

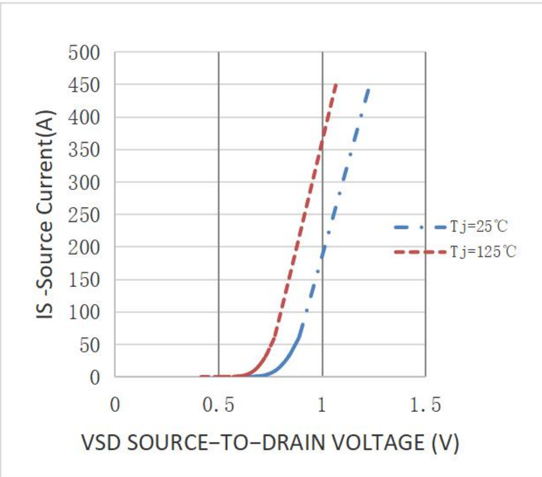


Figure 10. Transfer Characteristics

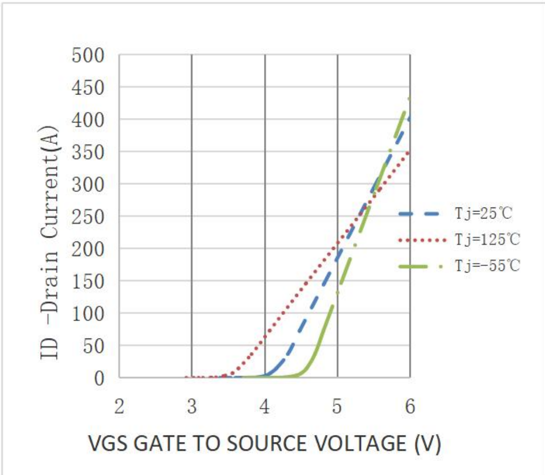


Fig.11 Safe Operating Area

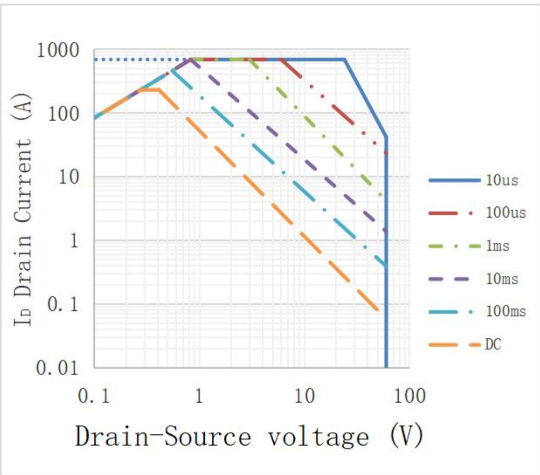
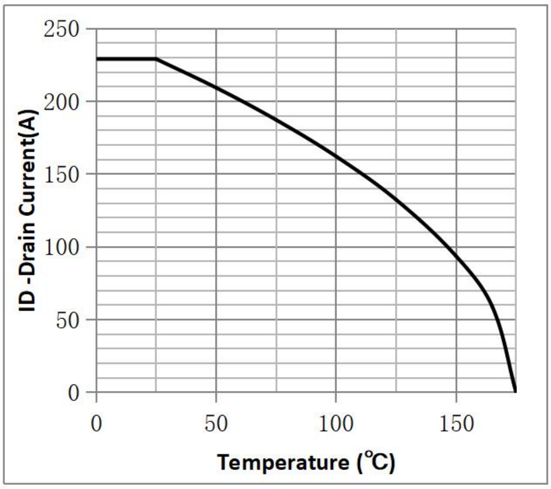
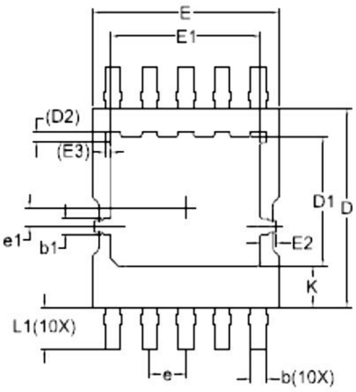


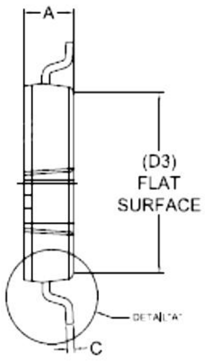
Fig.12 ID vs. Junction Temperature③



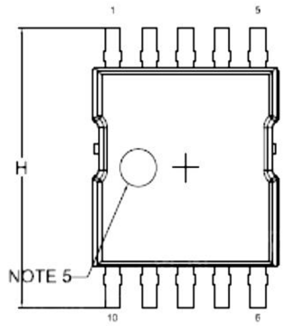
●DFN5*7 Package Outline



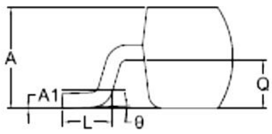
TOP VIEW



SIDE VIEW



BOTTOM VIEW



DEDAIL"A"
(2:1)

MILLIMETERS			
DIM	MIN	NOM	MAX
A	1.25	1.35	1.45
A1	-0.05	0	0.075
b	0.36	0.41	0.46
b1	0.30	0.40	0.50
c	0.16	0.20	0.26
D	5.20	5.30	5.40
D1	3.35	3.45	3.55
D2	0.29 REF		
D3	4.82 REF		
E	5.00	5.10	5.20
E1	4.02	4.12	4.22
E2	0.30	0.44	0.50
E3	0.14 REF		
e	1.00 BSC		
e1	0.50 BSC		
K	1.00	1.10	1.20
H	7.30	7.50	7.70
L	0.49	0.69	0.89
L1	0.90	1.10	1.30
Q	0.60	0.65	0.70
θ	0°	2.5°	5°

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. V_{GS}=10V.

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Revision History

Version	Date	Change
A	2024.1.12	NEW