

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

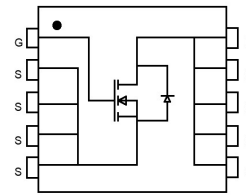
Ordering Information:

Part NO.	ZMSA022N04HTNC
Marking	22N04H
Packing Information	REEL TAPE
Basic ordering unit (pcs)	2500

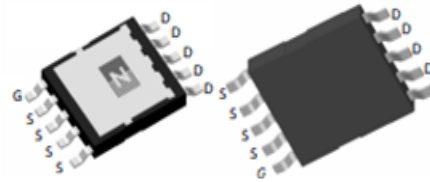
Absolute Maximum Ratings ($T_C=25^\circ\text{C}$)

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DS}		40	V
Gate-Source Voltage	V_{GS}		± 20	V
Continuous Drain Current	I_D	$T_C=25^\circ\text{C}$	135	A
	I_D	$T_C=75^\circ\text{C}$	111	A
	I_D	$T_C=100^\circ\text{C}$	96	A
Pulsed Drain Current ^①	I_{DM}	Pulsed; $t_p \leq 10 \mu\text{s}$; $T_{mb} = 25^\circ\text{C}$;	540	A
Total Power Dissipation	P_D	$T_C=25^\circ\text{C}$	107	W
Total Power Dissipation	P_D	$T_A=25^\circ\text{C}$	5.0	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=0.1mH, VGS=10V, Rg=25 Ω ,	106	mJ
		L=0.5mH, VGS=10V, Rg=25 Ω ,	190	mJ
ESD Level (HBM)	CLASS 2			

Product Summary



$V_{DS} = 40\text{V}$
 $R_{DS(ON)} = 2.2\text{m}\Omega$
 $I_D = 135\text{A}$



TCPAK5x7



•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}		-	1.4	°C/W
Thermal resistance, junction-ambient	$R_{thJA\oplus}$		-	30	°C/W
Soldering temperature (total time<10s)	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	2.9	4	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	$R_{DS(ON)}$	$V_{GS}=10V, I_D=30A$		2.2	2.9	m Ω
Forward Transconductance	g_{FS}	$V_{GS}=5V, I_{SD}=5A$		20		S
Diode Forward Voltage	V_{FSD}	$V_{GS}=0V, I_{SD}=30A$			1.3	V

•Dynamic characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	C_{iss}	$f=1MHz, V_{DS}=25V$	-	1773	-	pF
Output capacitance	C_{oss}		-	567	-	
Reverse transfer capacitance	C_{rss}		-	35	-	
Gate Resistance	R_g	$f=1MHz$	-	1.9		Ω
Total gate charge	Q_g	$V_{DD}=15V, I_D=24A, V_{GS}=10V$	-	26.5	-	nC
Gate - Source charge	Q_{gs}		-	7.8	-	
Gate - Drain charge	Q_{gd}		-	6.2	-	
Turn-ON Delay time	$t_{D(on)}$	$V_{GS}=10V, V_{DS}=15V, R_G=3.3\Omega, I_D=20A$	-	12	-	ns
Turn-ON Rise time	t_r		-	50	-	ns
Turn-Off Delay time	$t_{D(off)}$		-	25	-	ns
Turn-Off Fall time	t_f		-	6	-	ns
Reverse Recovery Time	t_{rr}	$V_{DD}=20V, dI_S/dt=100A/\mu s, I_S=20A$	-	49	-	ns
Reverse Recovery Charge	Q_{rr}		-	48	-	nC

Fig.1 Gate-Charge Characteristics

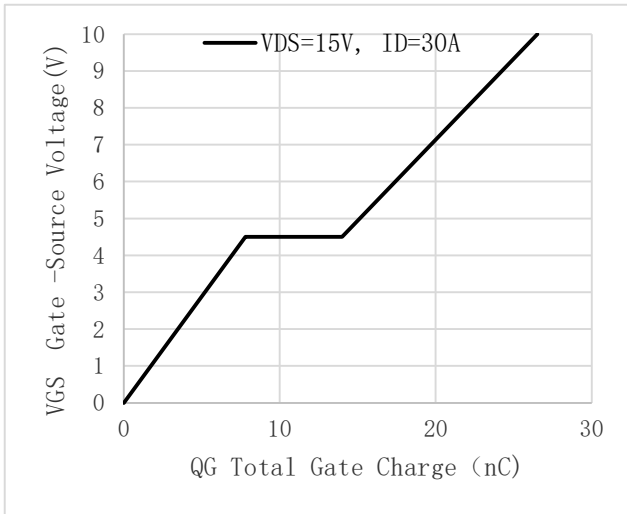


Fig.2 Capacitance Characteristics

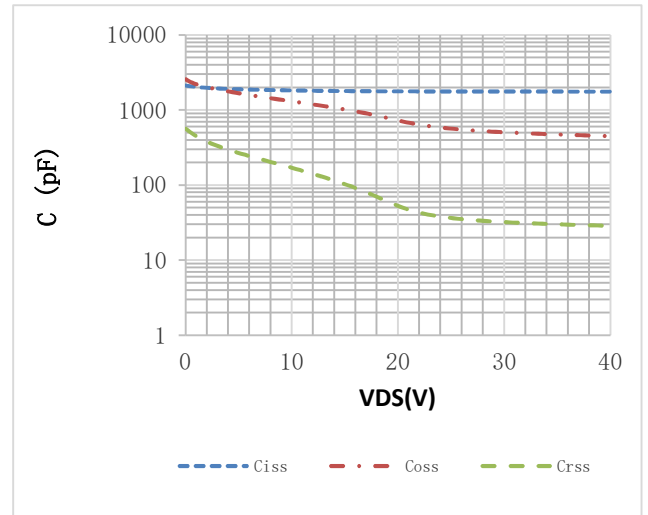


Fig.3 Power Dissipation

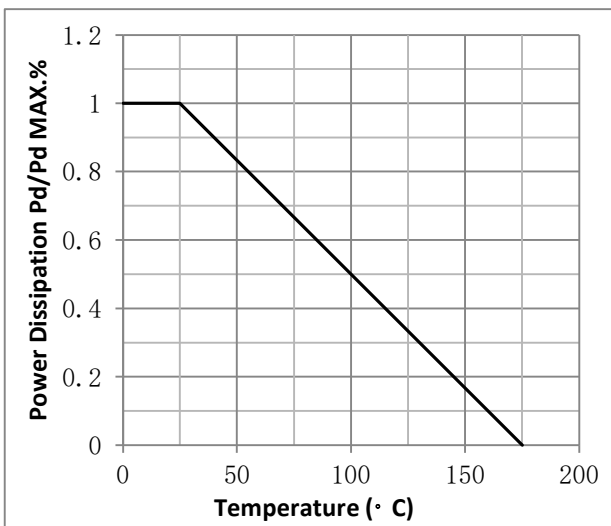


Fig.4 Typical output Characteristics

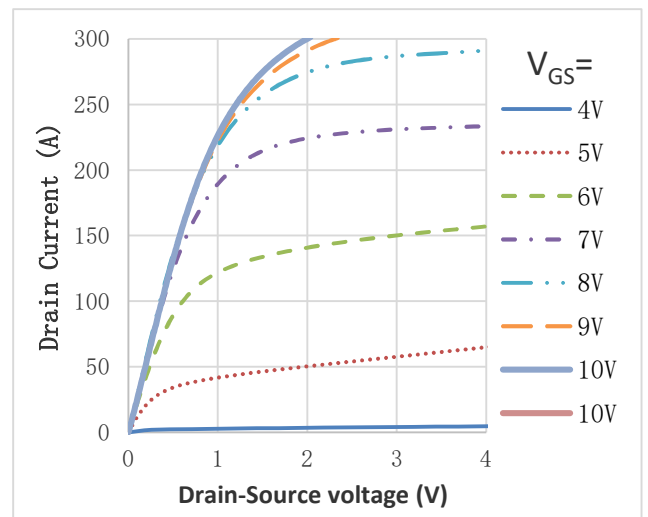


Fig.5 Threshold Voltage V.S Junction Temperature

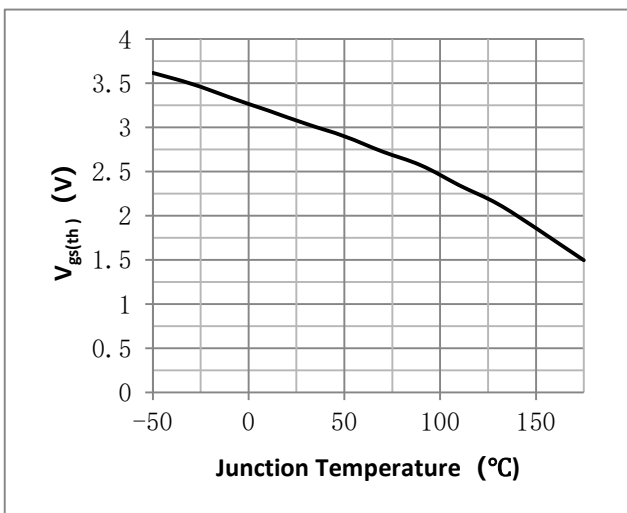


Fig.6 Resistance V.S Drain Current

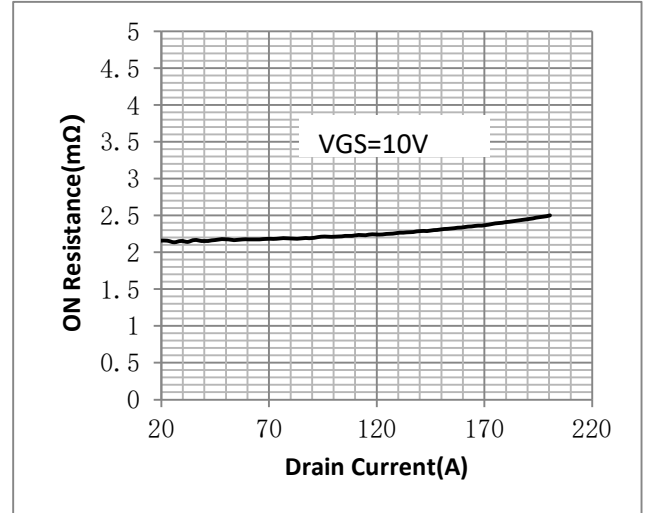


Fig.7 On-Resistance VS Gate Source Voltage

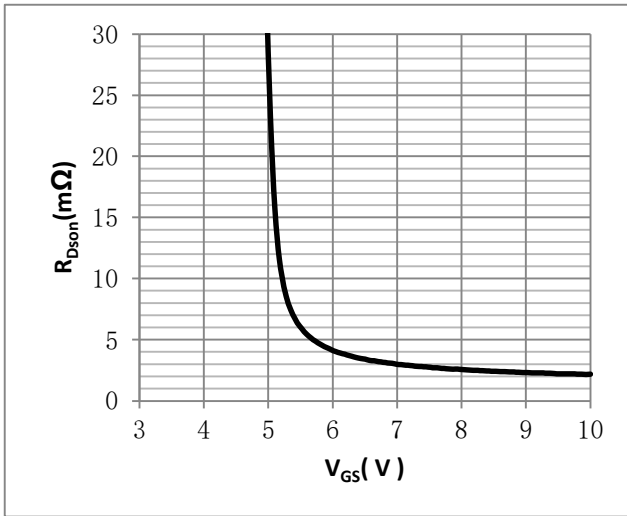


Fig.8 On-Resistance V.S Junction Temperature

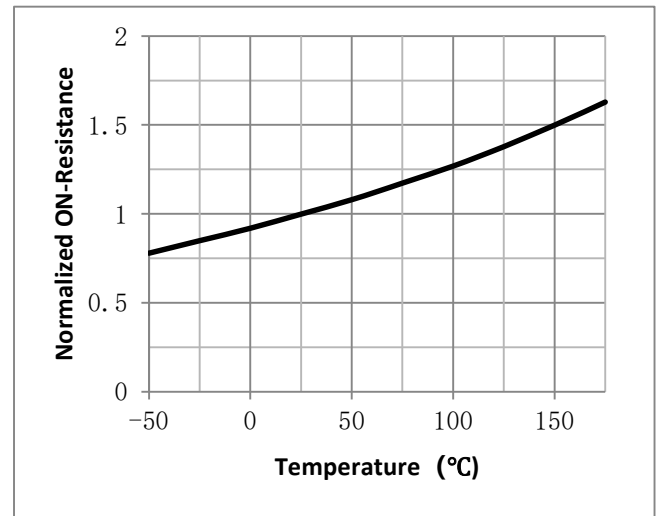


Figure 9. Diode Forward Voltage vs. Current

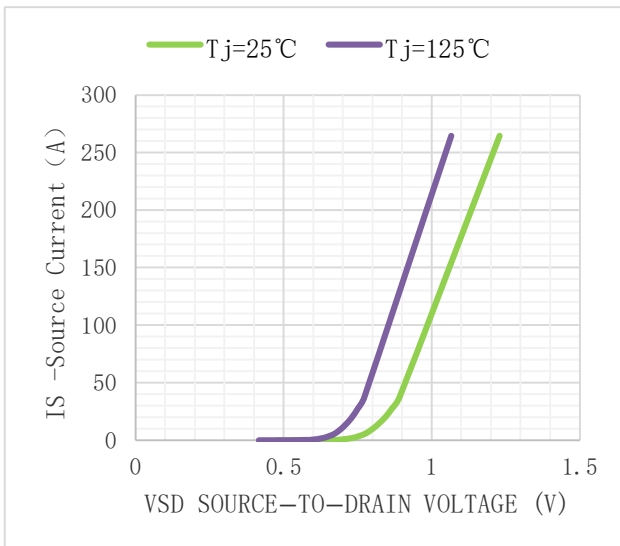


Figure 10. Transfer Characteristics

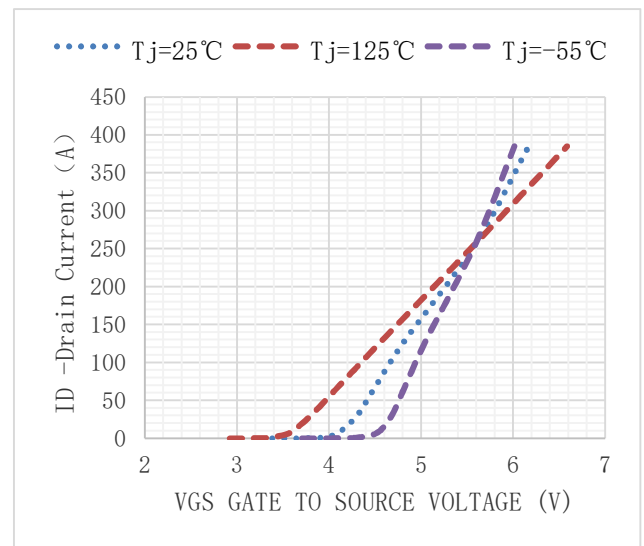


Fig.11 SOA Maximum Safe Operating Area

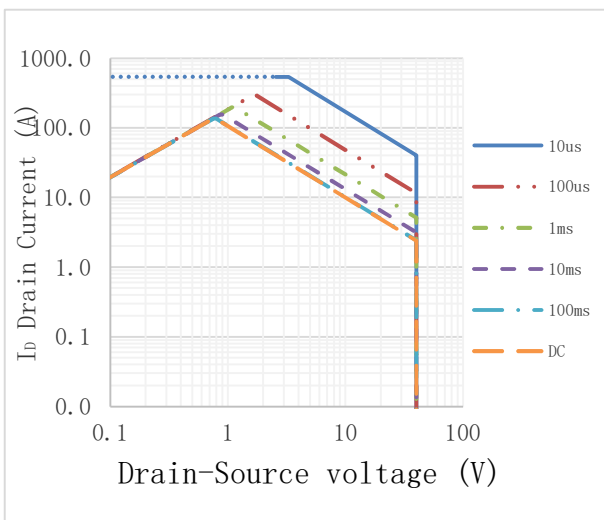
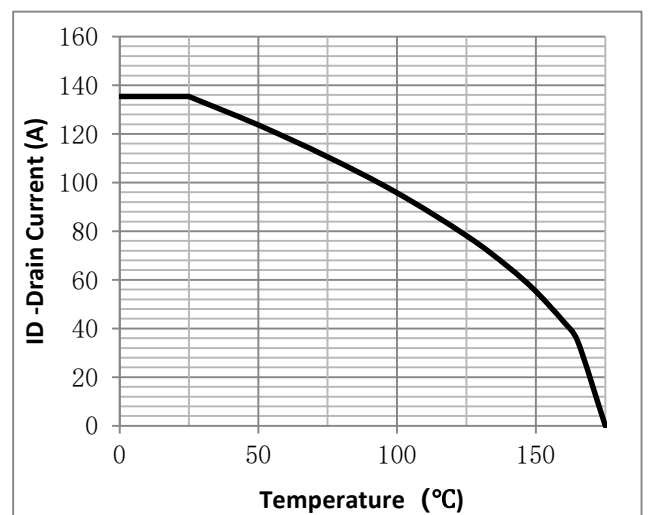
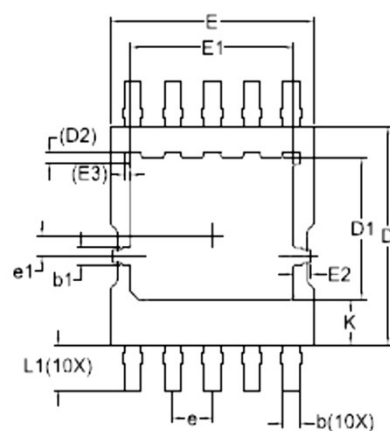


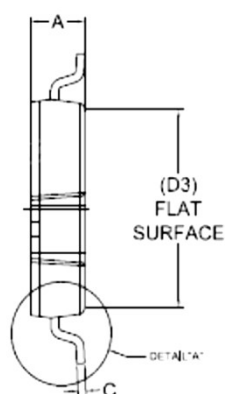
Fig.12 ID vs. Junction Temperature②



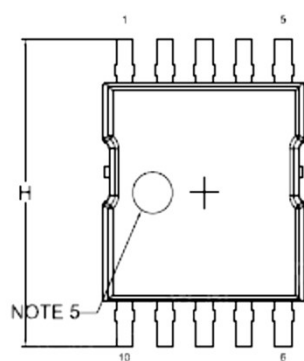
•TCPAK5x7 Package Outline



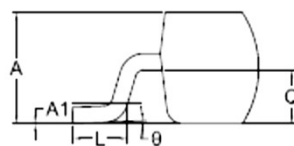
TOP VIEW



SIDE VIEW



BOTTOM VIEW



DETAIL '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 Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate;
- ② 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	2024/8/26	New
B	2025/7/11	Correct pin configuration.