

40V N-Channel Power SpeedFET

• General Description

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

• 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
- Battery protection

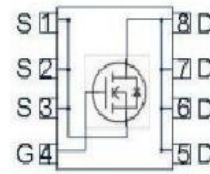
• Ordering Information:

Part NO.	ZMS011N04P
Marking	ZMS011N04
Packing Information	TUBE
Basic ordering unit (pcs)	1000

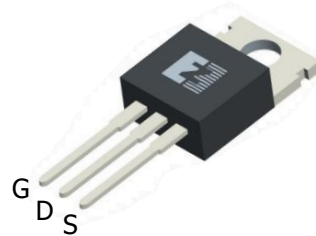
• Absolute Maximum Ratings ($T_C=25^\circ\text{C}$)

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DS}	$25^\circ\text{C} \leq T_J \leq 150^\circ\text{C}$	40	V
Gate-Source Voltage	V_{GS}		± 20	V
Continuous Drain Current	I_D	$T_C=25^\circ\text{C}$	190	A
	I_D	$T_C=75^\circ\text{C}$	142	A
	I_D	$T_C=100^\circ\text{C}$	116	A
Pulsed Drain Current ^①	I_{DM}	Pulsed; $t_p \leq 10 \mu\text{s}$; $T_{mb} = 25^\circ\text{C}$;	570	A
Total Power Dissipation	P_D	$T_C=25^\circ\text{C}$	150	W
Total Power Dissipation	P_D	$T_A=25^\circ\text{C}$	4.3	W
Operating Junction Temperature	T_J		-55 to +150	$^\circ\text{C}$
Storage Temperature	T_{STG}		-55 to +150	$^\circ\text{C}$
Single Pulse Avalanche Energy	E_{AS}	$L=0.1\text{mH}$, $V_{GS}=10\text{V}$, $R_g=25\Omega$,	320	mJ
		$L=0.5\text{mH}$, $V_{GS}=10\text{V}$, $R_g=25\Omega$,	680	mJ
ESD Level (HBM)	CLASS 2			

• Product Summary



$V_{DS} = 40\text{V}$
 $R_{DS(ON)} = 1.2\text{m}\Omega$
 $I_D = 190\text{A}$



TO-220



•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	RthJC		-	1.0	°C/W
Thermal resistance, junction-ambient	RthJA		-	35	°C/W
Soldering temperature	Tsold		-	260	°C

•Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250uA	40			V
Gate Threshold Voltage	V _{GS(TH)}	V _{GS} =V _{DS} , I _D =250uA	1.6	1.9	2.5	V
Drain-Source Leakage Current	I _{DSS}	V _{GS} =0V, V _{DS} = 40V			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	1.5	mΩ
		V _{GS} =4.5V, I _D = 30A		1.8	2.4	
Forward Transconductance	g _{FS}	V _{GS} =5V, I _{SD} = 10A		30		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	-	6500	-	pF
Output capacitance	Coss		-	1470	-	
Reverse transfer capacitance	Crss		-	76	-	
Gate Resistance	Rg	f = 1MHz	-	1.6		Ω
Total gate charge	Qg	V _{DD} = 15V, I _D = 20A, V _{GS} = 10V	-	96	-	nC
Gate - Source charge	Qgs		-	20	-	
Gate - Drain charge	Qgd		-	19	-	
Turn-ON Delay time	t _{D(on)}	V _{GS} =10V, V _{DS} =15V, R _G =3.3Ω, I _D =20A	-	16	-	ns
Turn-ON Rise time	t _r		-	11	-	ns
Turn-Off Delay time	t _{D(off)}		-	26	-	ns
Turn-Off Fall time	t _f		-	18	-	ns
Reverse Recovery Time	t _{RR}	V _{DD} =20V, dI _S /dt = 100A/s, I _S =50A	-	66	-	ns
Reverse Recovery Charge	Q _{RR}		-	97	-	nC

Fig.1 Gate-Charge Characteristics

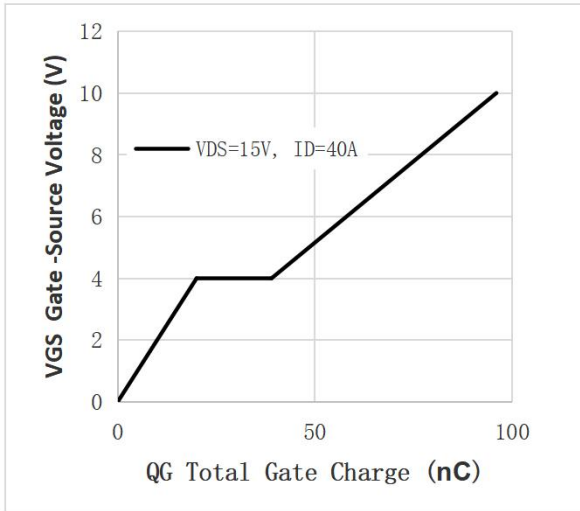


Fig.2 Capacitance Characteristics

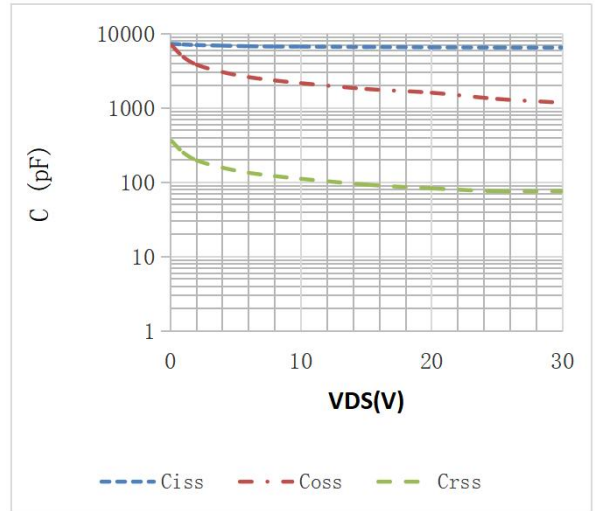


Fig.3 Power Dissipation

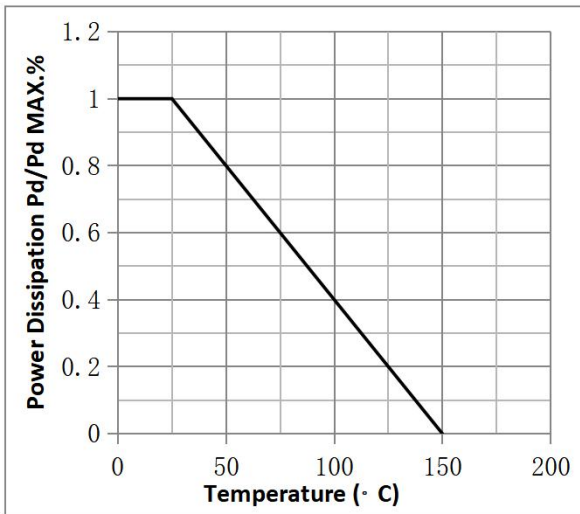


Fig.4 Typical output Characteristics

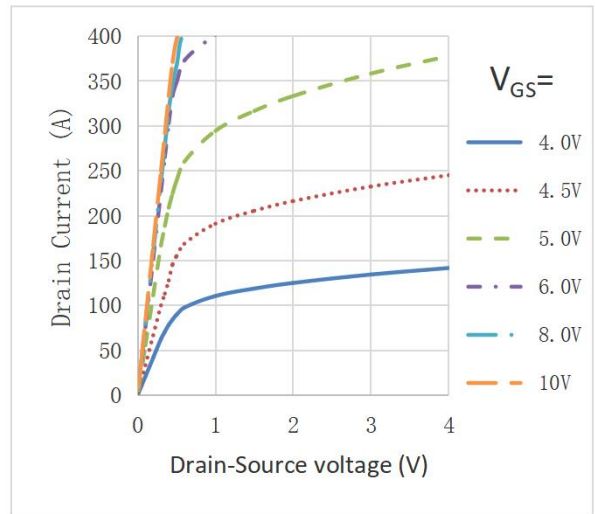


Fig.5 Threshold Voltage V.S Junction Temperature

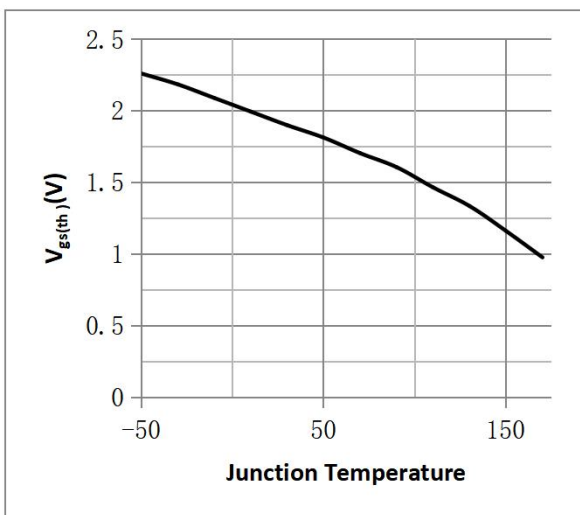


Fig.6 Resistance V.S Drain Current

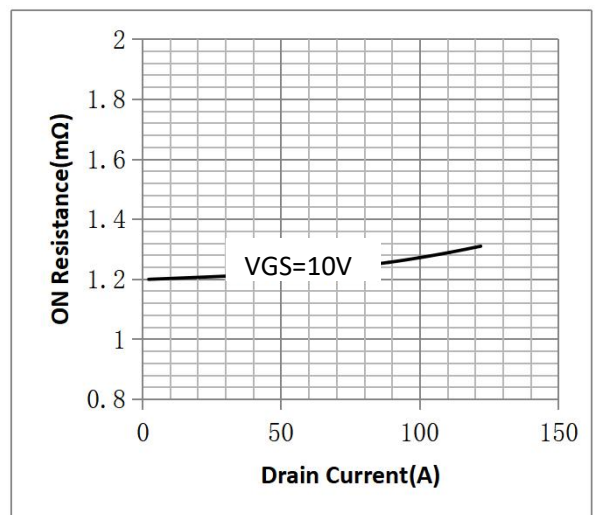


Fig.7 On-Resistance VS Gate Source Voltage

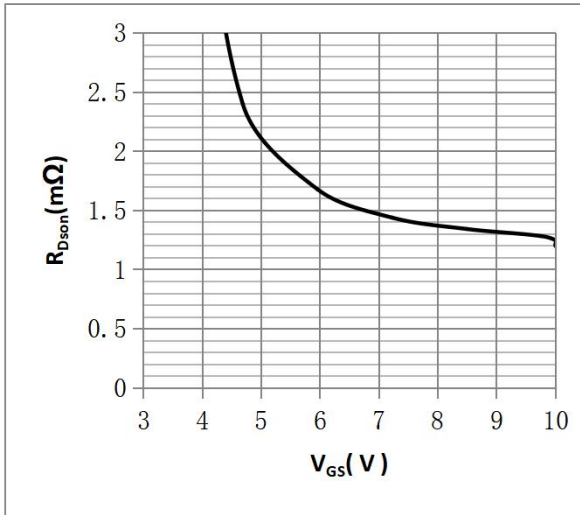


Fig.8 On-Resistance V.S Junction Temperature

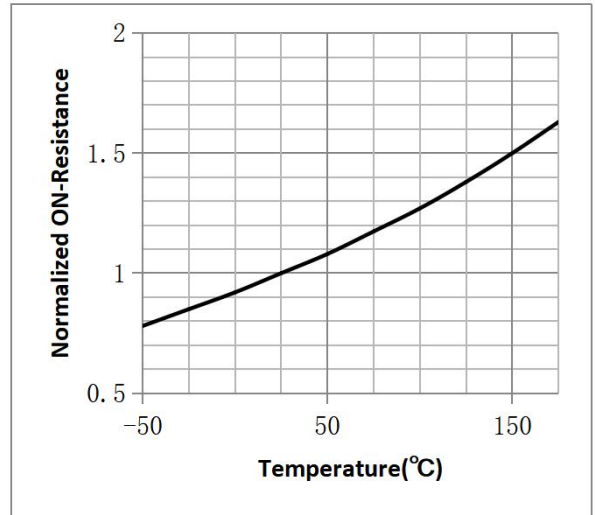


Figure 9. Diode Forward Voltage vs. Current

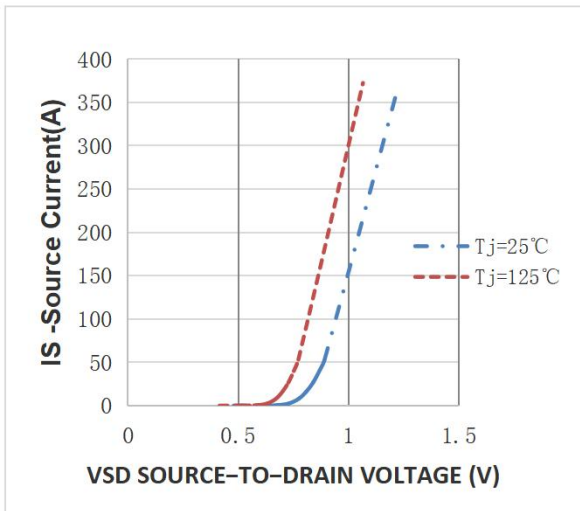


Figure 10. Transfer Characteristics

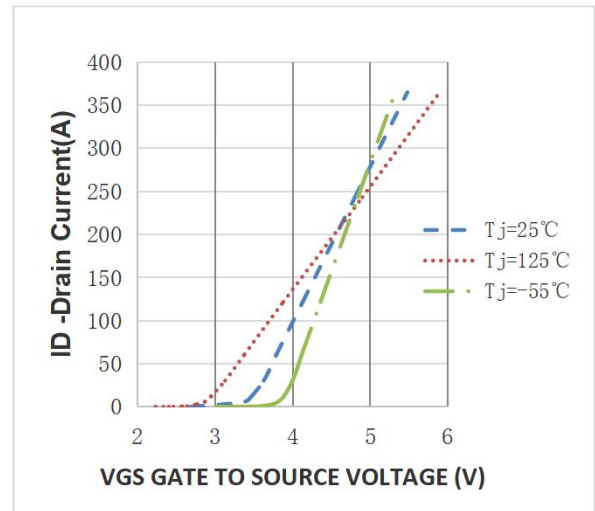


Fig.11 SOA Maximum Safe Operating Area

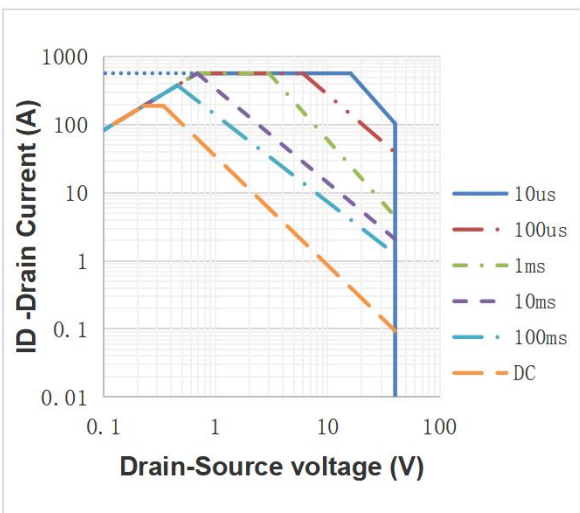
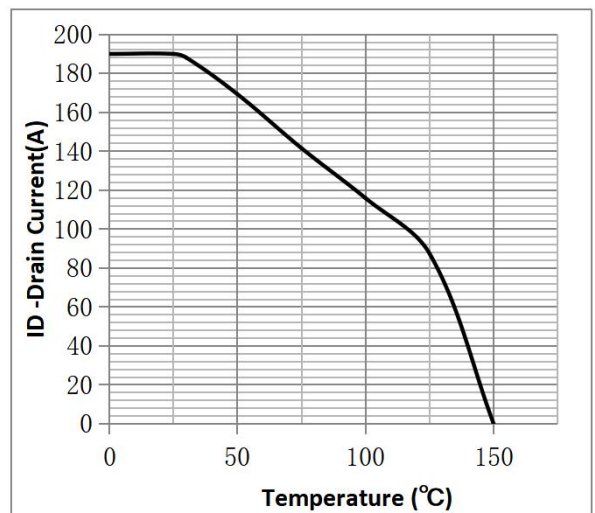
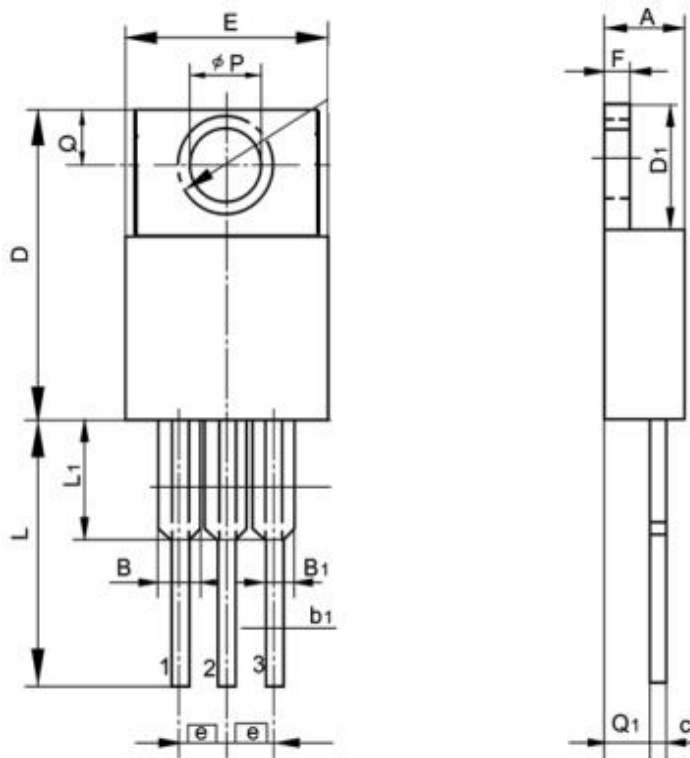


Fig.12 ID vs. Junction Temperature^①



•TO-220 Package Outline

SYMBOL	min	nom	max	SYMBOL	min	nom	max
A	4.00		4.80	E	9.90		10.70
B	1.20		1.50	e		2.54	
B1	1.00		1.40	F	1.10		1.45
b1	0.65		1.00	L	12.50		14.50
c	0.35		0.75	L1	3.00	3.50	4.00
D	15.00		16.50	Q	2.50		3.00
D1	5.90		6.90	Q1	2.00		3.00
				ΦP	3.60		3.90



Note:

① Practically the current will be limited by PCB, thermal design and operating temperature. VGS=10V.

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Revision History

Version	Date	Change
A	2022.1.15	
B	2022.2.20	1.Add Dynamic characteristic t_f , t_r etc.
C	2022.9.2	1.Add Reach, HF figure, 2.ID modify