

General Description

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

Features

- 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

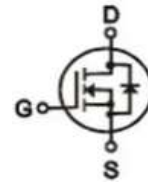
Ordering Information:

Part NO.	ZMS090N15HP
Marking	ZMS090N15H
Packing Information	TUBE
Basic ordering unit (pcs)	1000

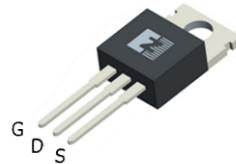
Absolute Maximum Ratings ($T_C=25^\circ\text{C}$)

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DS}		150	V
Gate-Source Voltage ^①	V_{GS}		± 20	V
Continuous Drain Current	I_D	$T_C=25^\circ\text{C}$	71	A
	I_D	$T_C=75^\circ\text{C}$	64	A
	I_D	$T_C=100^\circ\text{C}$	55	A
Pulsed Drain Current ^①	I_{DM}	Pulsed; $t_p \leq 10 \mu\text{s}$; $T_{mb} = 25^\circ\text{C}$;	213	A
Total Power Dissipation	P_D	$T_C=25^\circ\text{C}$	167	W
Total Power Dissipation	P_D	$T_A=25^\circ\text{C}$	3.8	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}	$L=0.1\text{mH}$, $V_{GS}=10\text{V}$, $R_g=25\Omega$,	110	mJ
		$L=0.5\text{mH}$, $V_{GS}=10\text{V}$, $R_g=25\Omega$,	253	mJ
ESD Level (HBM)	CLASS 2			

Product Summary



$V_{DS} = 150\text{V}$
 $R_{DS(ON)} = 10\text{m}\Omega$
 $I_D = 71\text{A}$



T0-220



•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	RthJC		-	0.9	°C/W
Thermal resistance, junction-ambient	RthJA ^②		-	40	°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	150			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} = 150V			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 = 20A		10	13	mΩ
Forward Transconductance	g _{FS}	V _{GS} = 5V, I _{SD} = 10A		20		s
Diode Forward Voltage	V _{FSD}	V _{GS} = 0V, I _{SD} = 20A			1.3	V

•Dynamic characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	Ciss	f = 1MHz, V _{DS} = 25V	-	3446	-	pF
Output capacitance	Coss		-	1720	-	
Reverse transfer capacitance	Crss		-	150	-	
Gate Resistance	Rg	f = 1MHz	-	2.5		Ω
Total gate charge	Qg	V _{DD} = 15V, I _D = 20A, V _{GS} = 10V	-	44	-	nC
Gate - Source charge	Qgs		-	13	-	
Gate - Drain charge	Qgd		-	9	-	
Turn-ON Delay time	t _{D(on)}	V _{GS} = 10V, V _{DS} = 15V, R _G = 3.3Ω, I _D = 20A	-	25	-	ns
Turn-ON Rise time	t _r		-	20	-	ns
Turn-Off Delay time	t _{D(off)}		-	36	-	ns
Turn-Off Fall time	t _f		-	13	-	ns
Reverse Recovery Time	t _{RR}	V _{DD} = 20V, dI _S /dt = 100A/us, I _S = 50A	-	76	-	ns
Reverse Recovery Charge	Q _{RR}		-	120	-	nC

Fig.1 Gate-Charge Characteristics

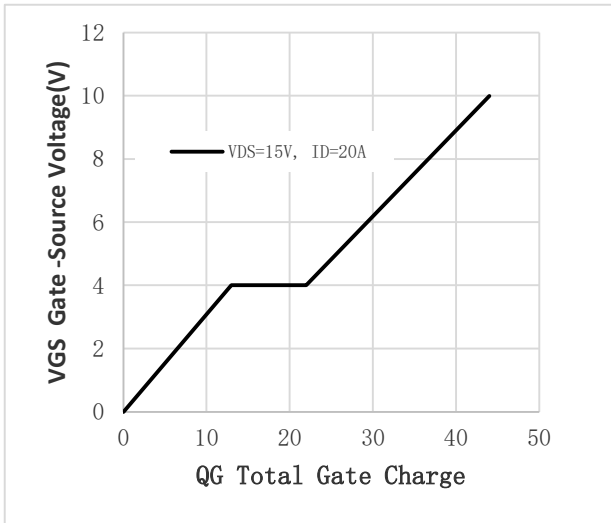


Fig.2 Capacitance Characteristics

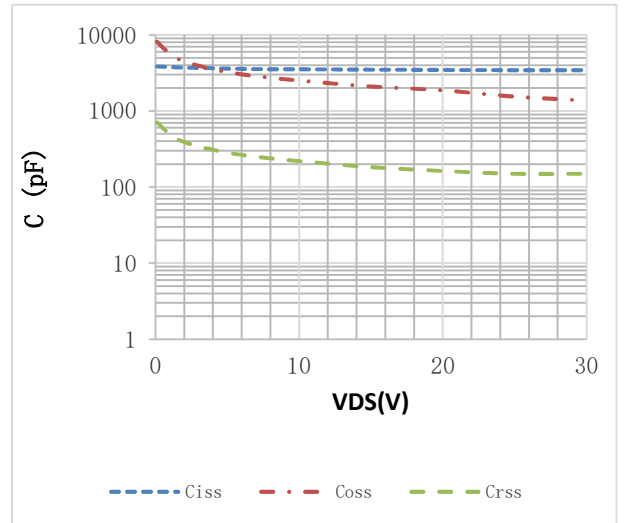


Fig.3 Power Dissipation

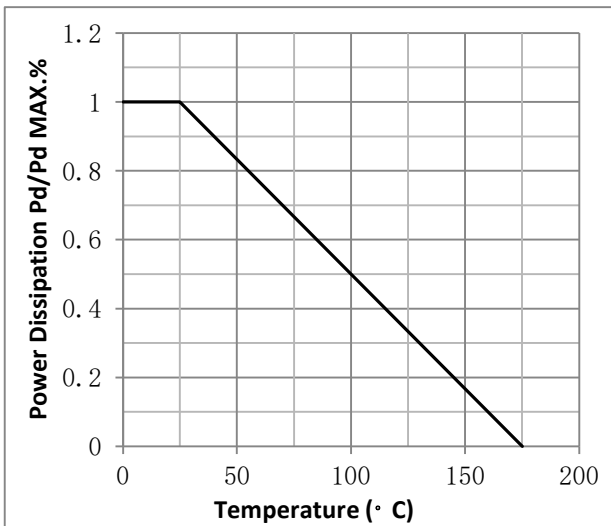


Fig.4 Typical output Characteristics

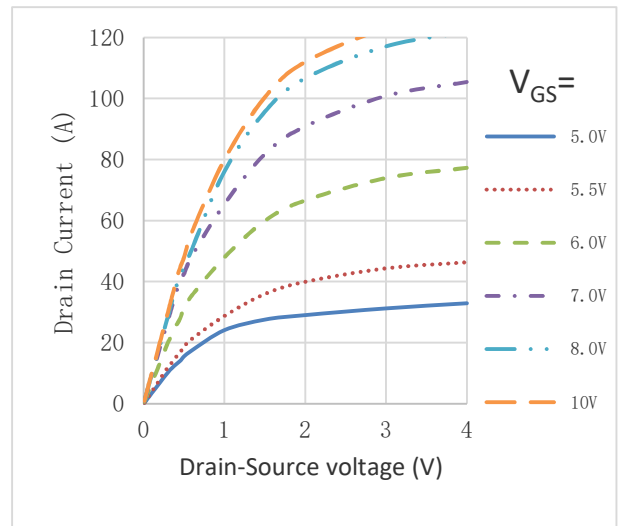


Fig.5 Threshold Voltage V.S Junction Temperature

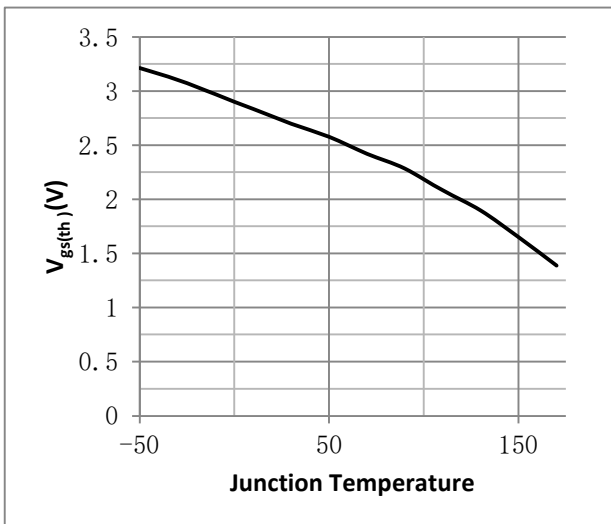


Fig.6 Resistance V.S Drain Current

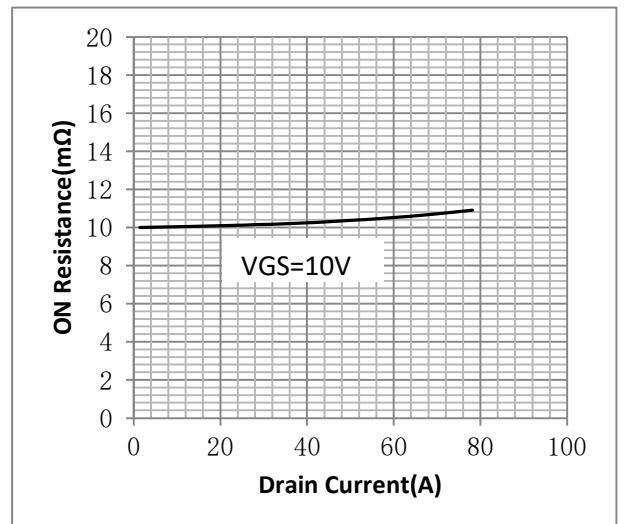


Fig.7 On-Resistance VS Gate Source Voltage

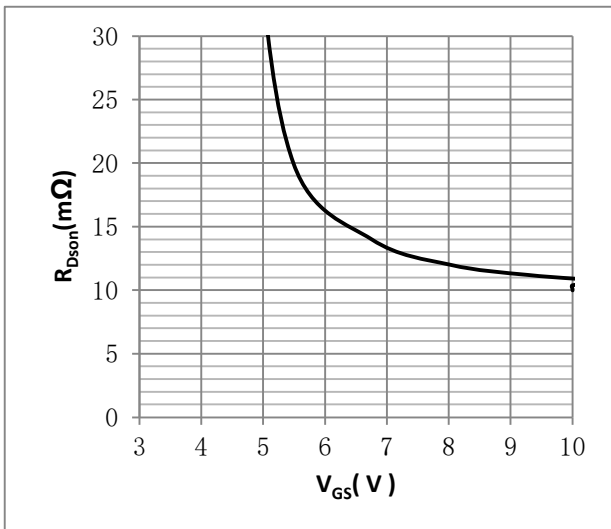


Fig.8 On-Resistance V.S Junction Temperature

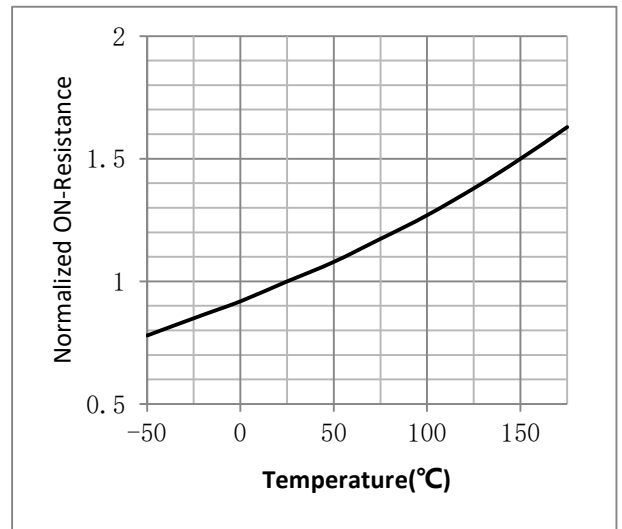


Figure 9. Diode Forward Voltage vs. Current

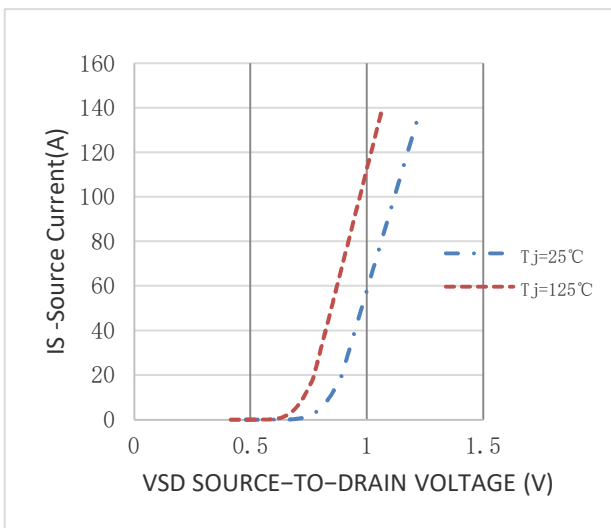


Figure 10. Transfer Characteristics

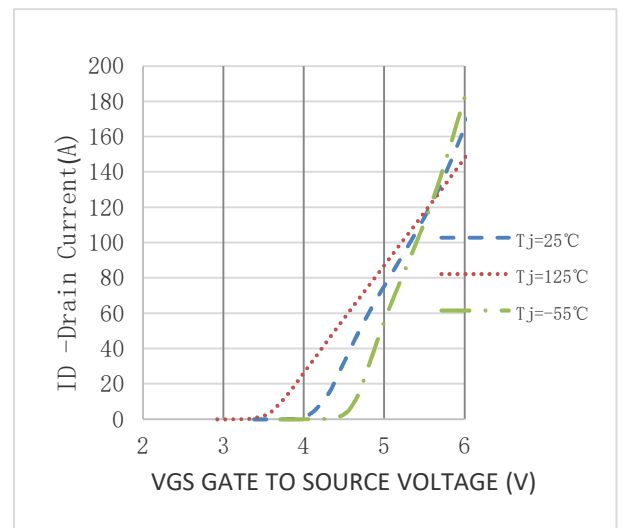


Fig.11 SOA Maximum Safe Operating Area

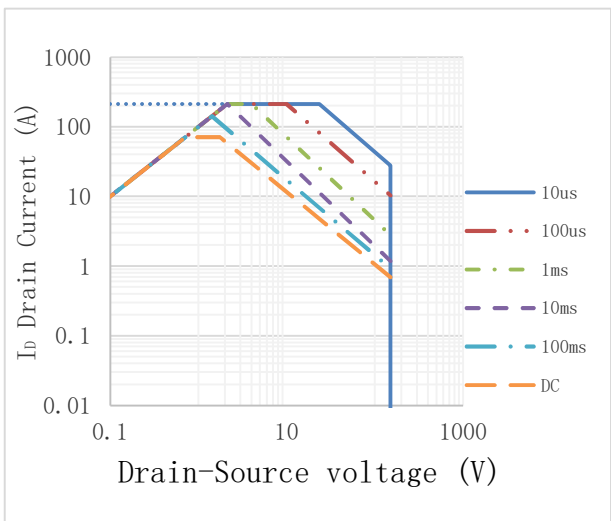
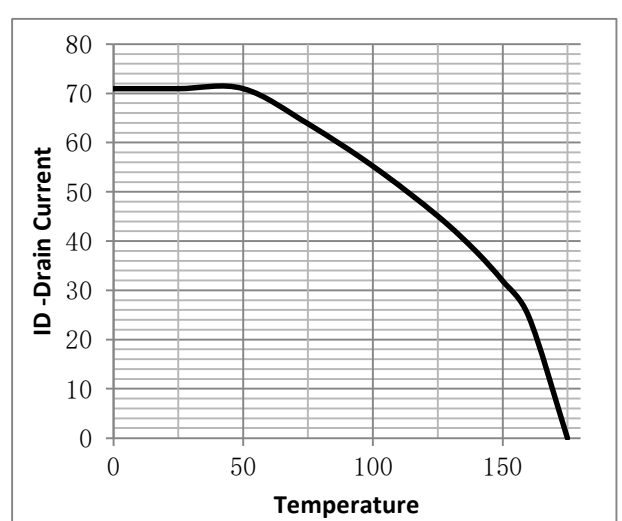
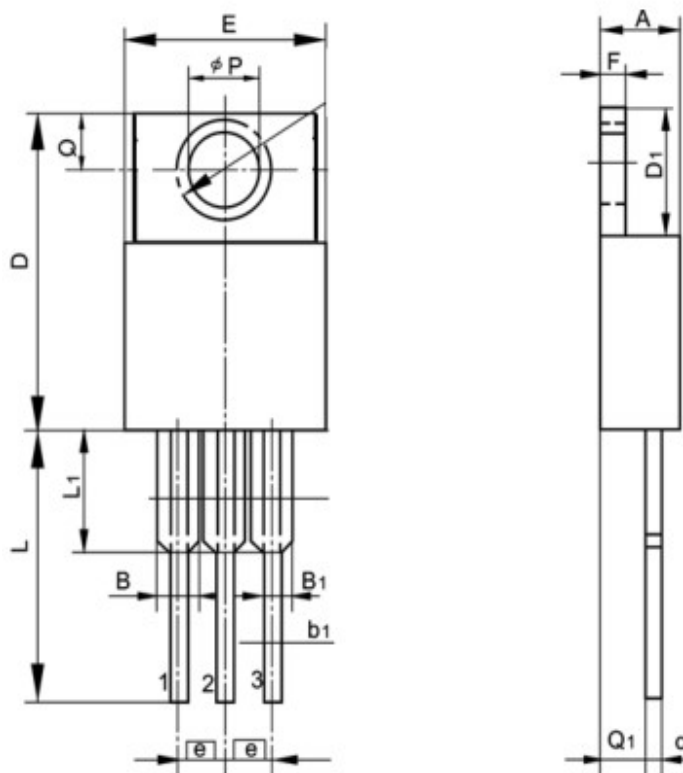


Fig.12 ID vs. Case Temperature[®]



•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



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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Revision History

Version	Date	Change
A	2021. 9. 6	
B	2022. 11. 5	1. Add Reach, HF figure, 2. ID modify
C	2023. 11. 1	Tj modify
D	2024. 5. 16	RJA modify