●General Description

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

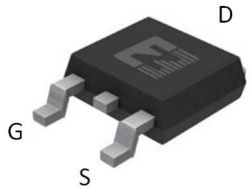
●Features

- ■Low $R_{DS(ON)}$ to minimize conductive loss
- ■High GOX reliability
- ■Low thermal resistance
- ■AEC-Q101 qualified

●Application

- ■BLDC motor driver
- ■DC-DC
- ■Load switch

●Product Summary



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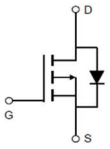


V_{DS}=-40V

$R_{DS(ON)}$ =11mR

I_D=-45A

RoHS REACH HF

●Ordering Information

Part NO.	ZMA120P04D
Marking	ZM120P04
Packing information	REEL TAPE
Basic ordering unit (pcs)	2500

●Absolute Maximum Ratings (T_A=25℃,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℃	-	-45	A
	I_D	V_{GS}=-10V, T_C=75℃	-	-42	A
	I_D	V_{GS}=-10V, T_C=100℃	-	-37	A
Pulsed drain current ①	I_{DM}	Pulsed; t_p ≤ 10 μs; T_C = 25 °C;	-	-180	A
Total power dissipation	P_D	T_C=25℃	-	75	W
Total power dissipation	P_D	T_A=25℃	-	2.4	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, R_g=25Ω,	-	80	mJ
		L=0.5mH, V_{GS}=-10V, R_g=25Ω,	-	168	mJ
ESD level (HBM)			CLASS 2		

●Thermal Resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}	-	-	2	°C/W
Thermal resistance, junction - ambient②	R_{thJA}	-	-	62	°C/W
Soldering temperature(total time<10s)	T_{sold}	-	-	260	°C

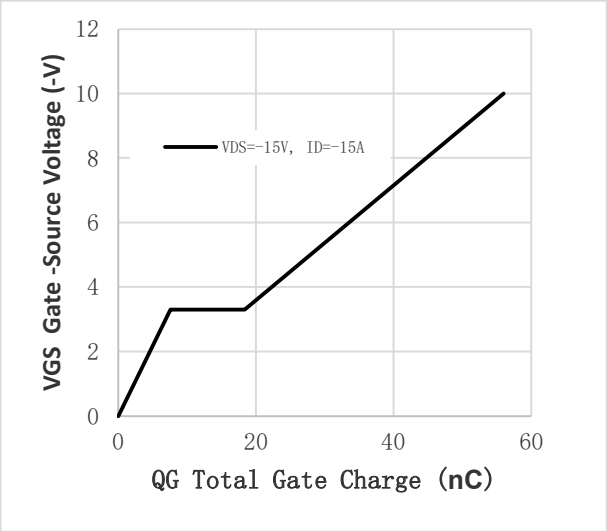
●Electronic Characteristics (T_j=25°C, unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage	BV_{DSS}	V_{GS} =0V, I_D =-250uA	-40	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{GS}=V_{DS}, I_D=-250uA	-1.3	-1.8	-2.5	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=-15A, T_j=25℃	-	11	14	mΩ
		V_{GS}=-4.5V, I_D=-10A, T_j=25℃	-	17	21	mΩ
Forward transconductance	g_{FS}	V_{DS} =-5V, I_{SD} = -10A	-	18	-	S
Diode forward voltage	V_{FSD}	V_{GS} =0V, I_{SD} = -15A	-	-	-1.3	V

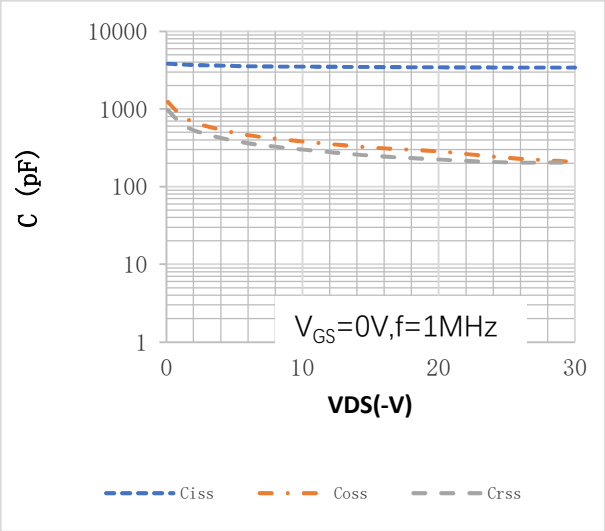
●Dynamic Characteristics (T_j=25°C, unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	C_{iss}	f = 1MHz, V_{DS}=-25V, V_{GS}=0V	-	3430	-	pF
Output capacitance	C_{oss}		-	262	-	pF
Reverse transfer capacitance	C_{rss}		-	206	-	pF
Gate resistance	R_g	f = 1MHz	-	9	-	Ω
Total gate charge	Q_g	V_{DD} = -15V, I_D = -20A, V_{GS} = -10V	-	56	-	nC
	Q_g(-4.5V)		-	25	-	nC
Gate-source charge	Q_{gs}		-	7.6	-	nC
Gate-drain charge	Q_{gd}		-	10.8	-	nC
Turn-on delay time	$t_{D(on)}$	V_{GS}=-10V, V_{DS}=-15V, R_G =3.3Ω, I_D =-20A	-	12	-	ns
Turn-on rise time	t_r		-	19	-	ns
Turn-off delay time	$t_{D(off)}$		-	94	-	ns
Turn-off fall time	t_f		-	35	-	ns
Reverse recovery time	t_{rr}	V_{DD}=-20V, dIs/dt = -100A/us, I_S=-20A	-	102	-	ns
Reverse recovery charge	Q_{rr}		-	385	-	nC

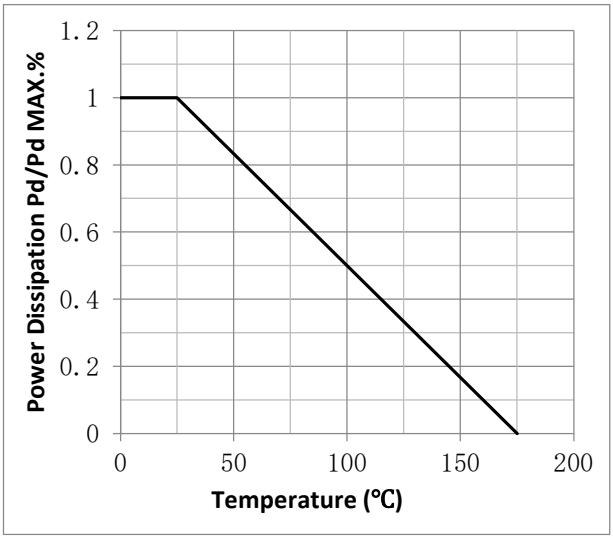
●Fig.1 Gate-source voltage as a function of gate charge; Typical values; T_j=25℃



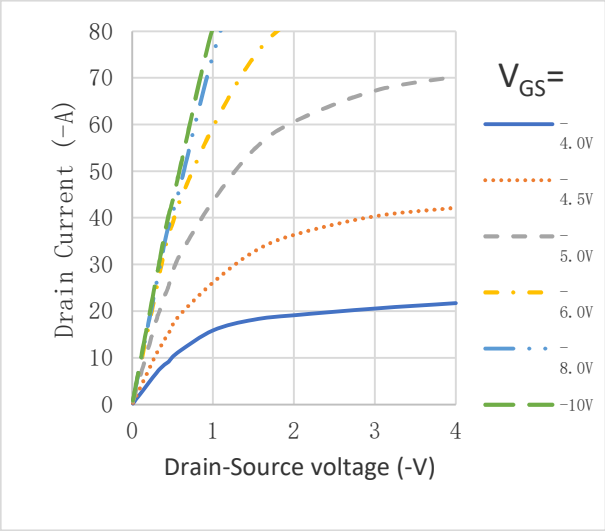
●Fig.2 Input, output and reverse transfer capacitances as a function of drain-source voltage; Typical values; T_j=25℃



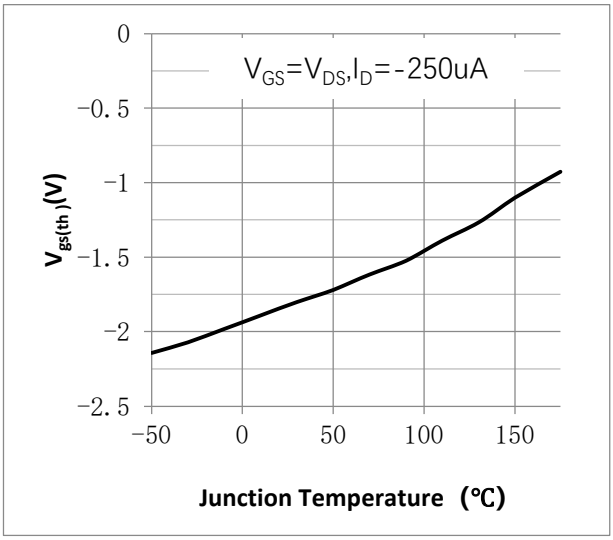
●Fig.3 Normalized total power dissipation as a function of case temperature; Calculative values Normalized Power Dissipation =P_d/P_d(25℃)



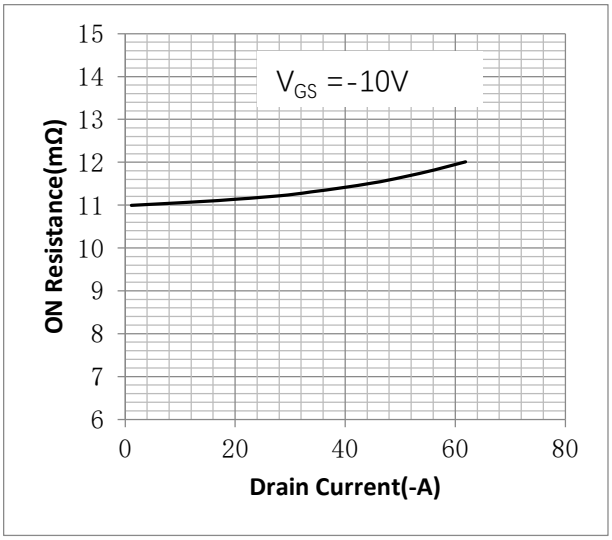
●Fig.4 Output characteristics: drain current as a function of drain-source voltage; Typical values: T_j=25℃



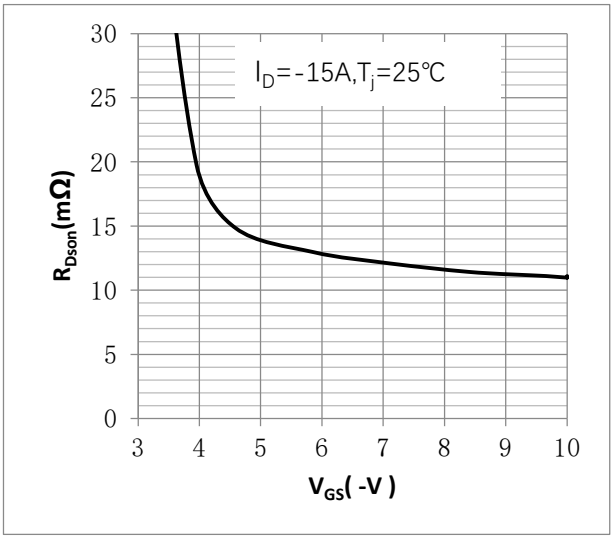
●Fig.5 Gate-source threshold voltage as a function of junction temperature; Typical values



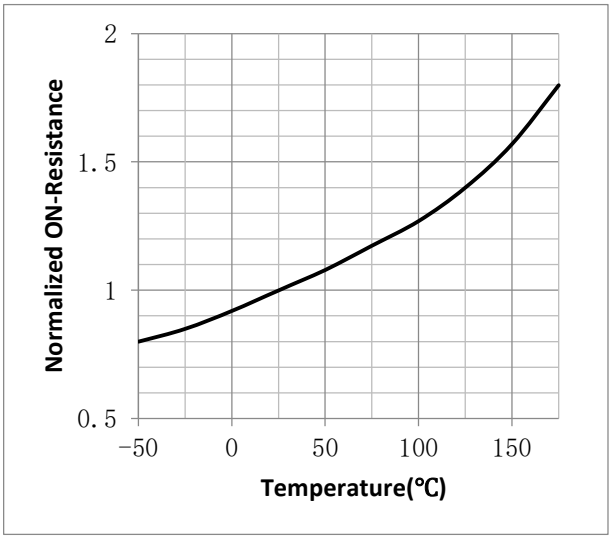
●Fig.6 Drain-source on-state resistance as a function of drain current; Typical values; Tj=25℃



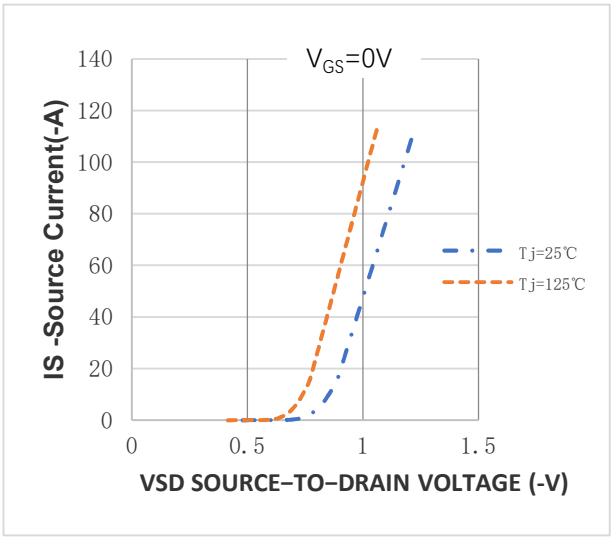
●Fig.7 Drain-source on-state resistance as a function of gate-source voltage; Typical values



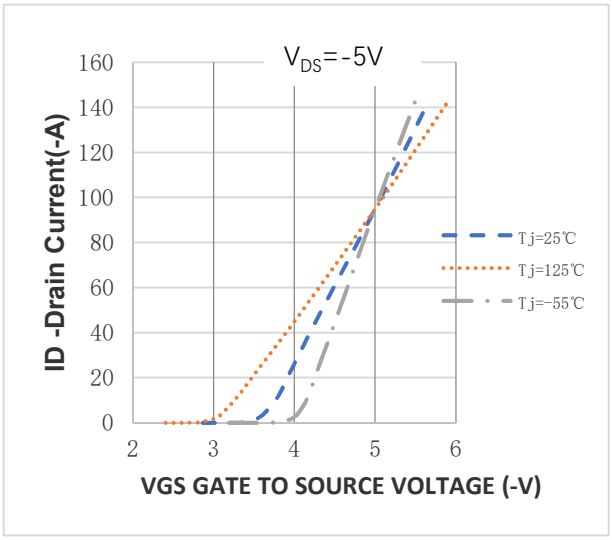
●Fig.8 Normalized drain-source on-state resistance factor as a function of junction temperature; Typical values Normalized On-Resistance=R_{DSon}/R_{DSon}(25℃)



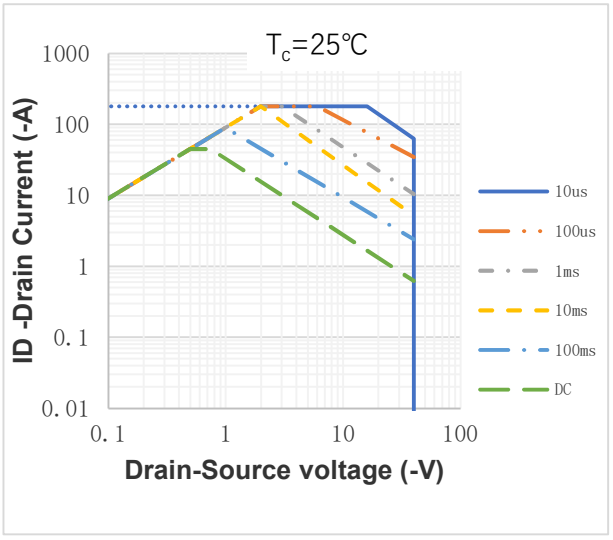
●Figure 9. Source (diode forward) current as a function of source-drain (diode forward) voltage; Typical values



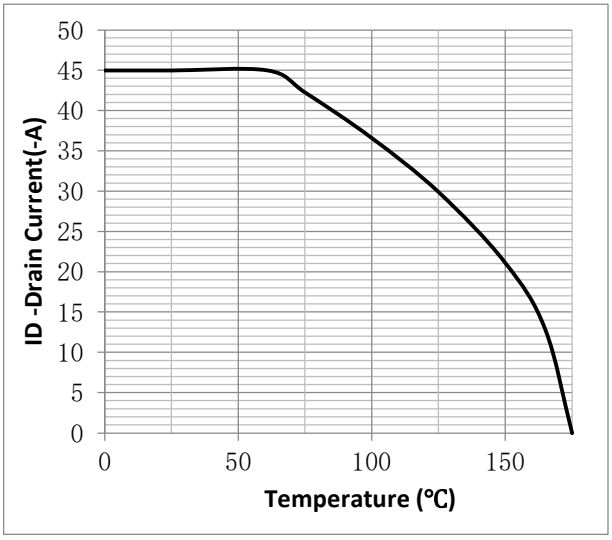
●Figure 10. Transfer characteristics: drain current as a function of gate-source voltage; Typical values



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

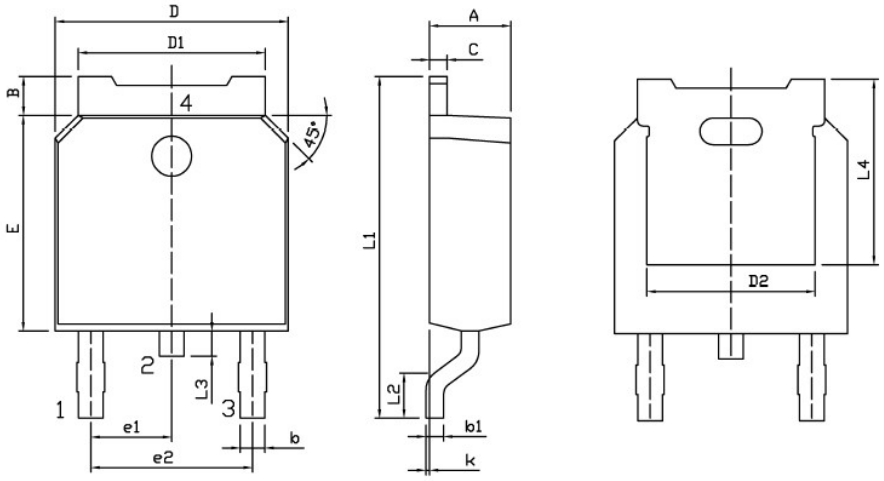


●Fig.12 Continuous drain current as a function of case temperature[3] ;Calculative values

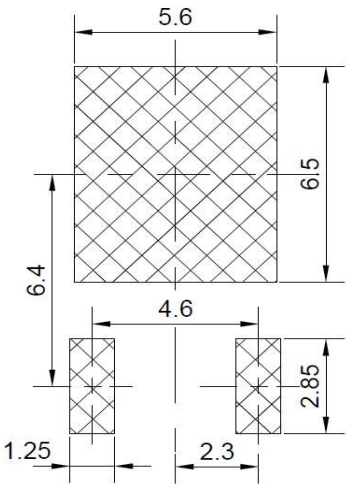


●Package Outline

Option L:

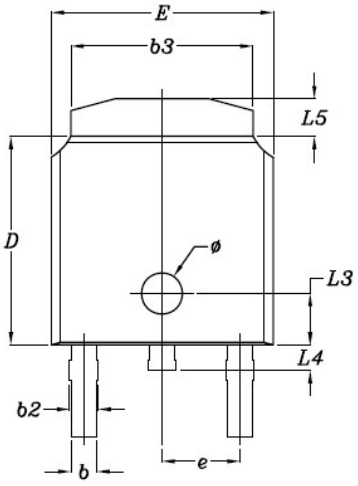


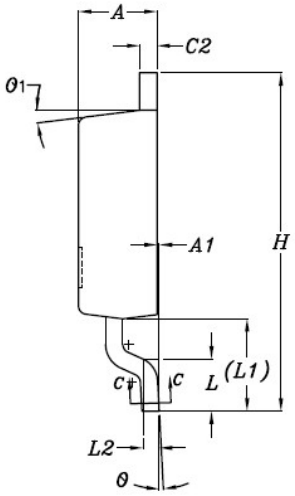
Land Pattern
(Only for Reference)

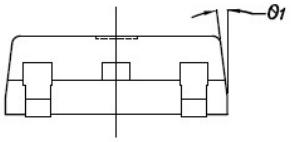


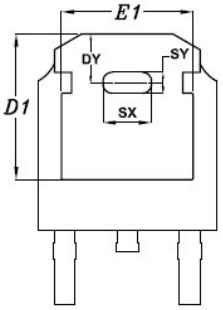
Dimensions In Millimeters					
Symbol	MIN	MAX	Symbol	MIN	MAX
A	2.20	2.40	E	5.95	6.25
B	0.95	1.25	e1	2.24	2.34
b	0.70	0.90	e2	4.43	4.73
b1	0.45	0.55	L1	9.85	10.35
C	0.45	0.55	L2	1.70	2.00
D	6.45	6.75	L3	0.60	0.90
D1	5.10	5.50	L4	5.05	
D2	4.85		k	0.00	0.10

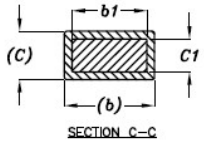
Option Q:





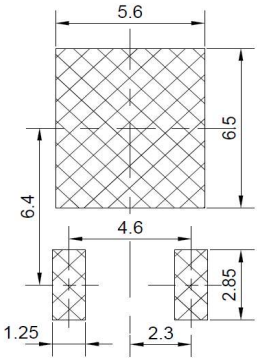






ITEM	DIMENSIONS			
	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.18	2.39	0.086	0.094
A1	——	0.13	——	0.005
b	0.70	0.89	0.028	0.035
b1	0.70	0.86	0.028	0.034
b2	0.76	1.14	0.030	0.045
b3	4.95	5.46	0.195	0.215
c	0.46	0.61	0.018	0.024
c1	0.41	0.56	0.016	0.022
c2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	5.21	5.54	0.205	0.218
E	6.35	6.73	0.250	0.265
E1	4.32	5.27	0.170	0.207
e	2.29 BSC		0.090 BSC	
H	9.40	10.41	0.370	0.410
L	1.40	1.78	0.055	0.070
L1	2.60	2.90	0.102	0.114
L2	0.51 BSC		0.020 BSC	
3 L3	1.65	1.95	0.065	0.077
L4	0.60	0.90	0.024	0.035
3 L5	0.89	1.27	0.035	0.050
θ	1°	5°	1°	5°
θ1	7° REF		7° REF	
ø	1.20 REF		0.047 REF	
SX	1.52 REF		0.060 REF	
SY	0.50 REF		0.020 REF	
DY	1.70 REF		0.067 REF	

Land Pattern
(Only for Reference)



●Note

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

②Device 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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● Since ZMJ uses lot number as the tracking base, please provide the lot number for tracking when complaining.

●Revision History

Version	Date	Change
A	2021/2/25	New
B	2022/6/7	1.Add Reach,HF figure. 2.ID modify
C	2022/10/20	1.Add It is suitable for automotive application. 2.Add total time<10s 3.ID curve modified
D	2023/12/19	Correct SOA
E	2024/11/6	RDSon modified.
F	2025/11/14	1. Apply new datasheet format. 2. Update POD