

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
- High GOX reliability
- Low Thermal resistance

Application

- BLDC Motor driver
- DC-DC
- Load Switch

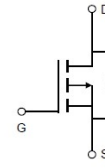
Ordering Information:

Part NO.	ZMSA023P04N
Marking	ZMS023P04
Packing Information	REEL TAPE
Basic ordering unit (pcs)	3000

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

Parameter	Symbol	Conditions	Min.	Max.	Unit
Drain-Source Voltage	V_{DS}		-	-40	V
Gate-Source Voltage	V_{GS}		-20	20	V
Continuous Drain Current	I_D	$V_{GS}=-10\text{V}, T_C=25^\circ\text{C}$	-	-226	A
	I_D	$V_{GS}=-10\text{V}, T_C=75^\circ\text{C}$	-	-184	A
	I_D	$V_{GS}=-10\text{V}, T_C=100^\circ\text{C}$	-	-160	A
Pulsed Drain Current	I_{DM}	Pulsed; $t_p \leq 10 \mu\text{s}; T_C = 25^\circ\text{C};$	-	-904	A
Total Power Dissipation	P_D	$T_C=25^\circ\text{C}$	-	254	W
Total Power Dissipation	P_D	$T_A=25^\circ\text{C}$	-	3.3	W
Operating Junction Temperature	T_J		-55	175	$^\circ\text{C}$
Storage Temperature	T_{STG}		-55	175	$^\circ\text{C}$
Single Pulse Avalanche Energy	E_{AS}	$L=0.1\text{mH}, V_{GS}=-10\text{V}, R_g=25\Omega,$	-	500	mJ
		$L=0.5\text{mH}, V_{GS}=-10\text{V}, R_g=25\Omega,$	-	900	mJ
ESD Level (HBM)	CLASS 2				

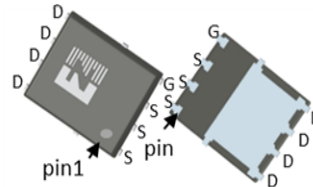
Product Summary



$$V_{DS} = -40\text{V}$$

$$R_{DS(ON)} = 2.6\text{m}\Omega$$

$$I_D = -226\text{A}$$



DFN5*6



•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction-case	R_{thJC}	-	-	0.59	°C/W
Thermal resistance, junction-ambient ^①	R_{thJA}	-	-	45	°C/W
Soldering temperature	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}	$V_{GS}=0V, I_D=-250\mu A$	-40	-	-	V
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1.3	-1.8	-2.5	V
Drain-Source Leakage Current	I_{DSS}	$V_{GS}=0V, V_{DS}=-40V, T_j=25^\circ C$	-	-	1.0	uA
		$V_{GS}=0V, V_{DS}=-40V, T_j=175^\circ C$	-	-	100	uA
Gate- Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	±100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-15A, T_j=25^\circ C$	-	2.6	3.1	mΩ
		$V_{GS}=-10V, I_D=-15A, T_j=175^\circ C$	-	4.5	-	mΩ
		$V_{GS}=-4.5V, I_D=-10A, T_j=25^\circ C$	-	4	4.8	mΩ
		$V_{GS}=-4.5V, I_D=-10A, T_j=175^\circ C$	-	6.6	-	mΩ
Forward Transconductance	g_{FS}	$V_{DS}=-5V, I_D=-10A$	-	29	-	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}	$f=1MHz, V_{DS}=-20V, V_{GS}=0V$	-	7425	-	pF
Output capacitance	C_{oss}		-	1808	-	
Reverse transfer capacitance	C_{rss}		-	171	-	
Gate Resistance	R_g	$f=1MHz, V_{GS}=0V$	-	6.1	-	Ω
Total gate charge	Q_g	$V_{DD}=-20V, I_D=-15A, V_{GS}=-10V$	-	102	-	nC
	$Q_g (-4.5V)$		-	50	-	
Gate - Source charge	Q_{gs}		-	20	-	
Gate - Drain charge	Q_{gd}		-	13	-	
Turn-ON Delay time	$t_{D(on)}$	$V_{GS}=-10V, V_{DS}=-20V, R_G=3.3\Omega, I_D=-15A$	-	17	-	ns
Turn-ON Rise time	t_r		-	81	-	ns
Turn-Off Delay time	$t_{D(off)}$		-	345	-	ns
Turn-Off Fall time	t_f		-	178	-	ns
Reverse Recovery Time	t_{rr}	$V_{DD}=-20V, dI_S/dt=100A/us, I_S=-15A$	-	49	-	ns
Reverse Recovery Charge	Q_{rr}		-	56	-	nC

Fig.1 Gate-source voltage as a function of gate charge; Typical values; $T_j=25^\circ\text{C}$

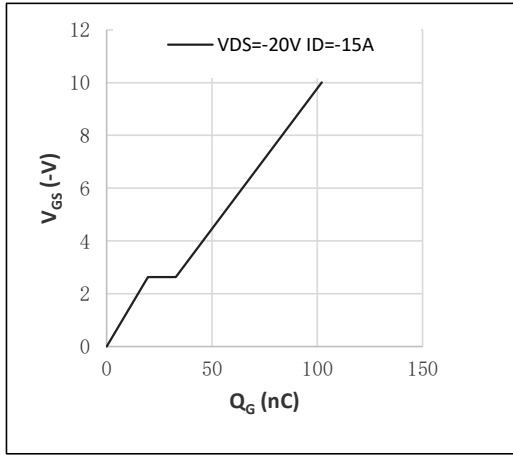


Fig.2 Input, output and reverse transfer capacitances as a function of drain-source voltage; Typical values; $T_j=25^\circ\text{C}$

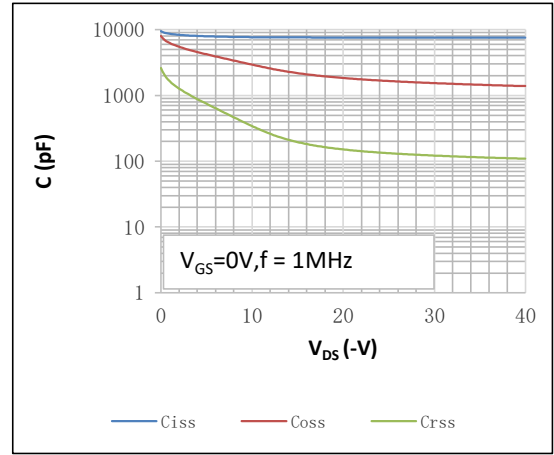


Fig.3 Output characteristics: drain current as a function of drain-source voltage; Typical values; $T_j=25^\circ\text{C}$

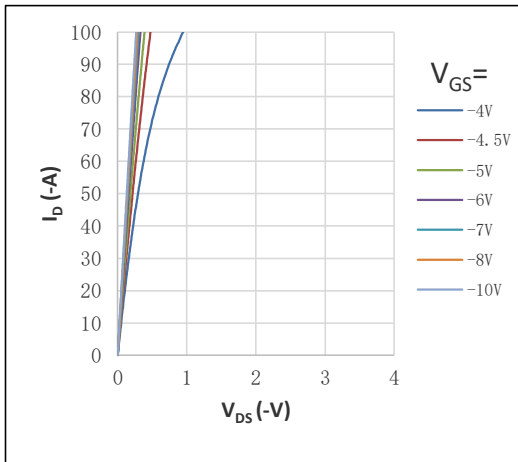


Fig.4 Output characteristics: drain current as a function of drain-source voltage; Typical values: Expanded curve; $T_j=25^\circ\text{C}$

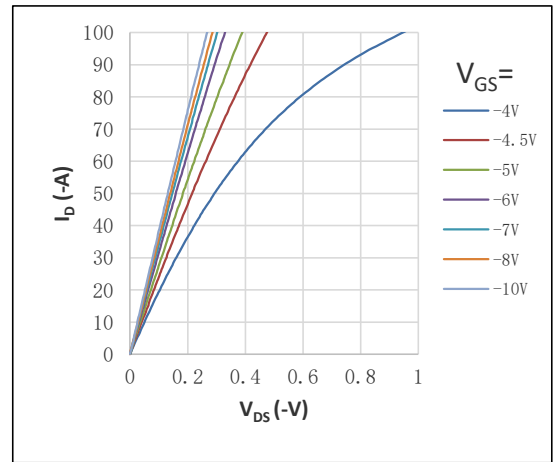


Fig.5 Gate-source threshold voltage as a function of junction temperature; Typical values

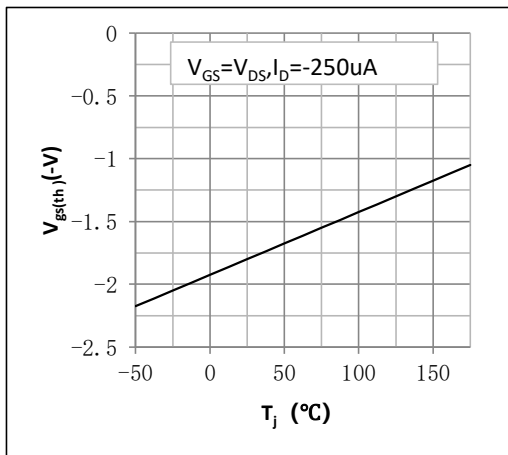


Fig.6 Drain-source on-state resistance as a function of drain current; Typical values; $T_j=25^\circ\text{C}$

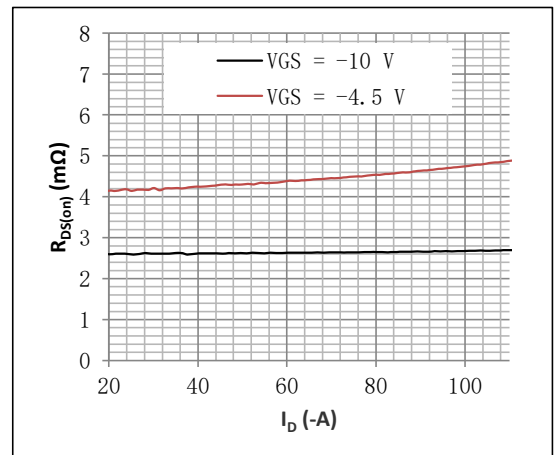


Fig.7 Drain-source on-state resistance as a function of gate-source voltage;Typical values

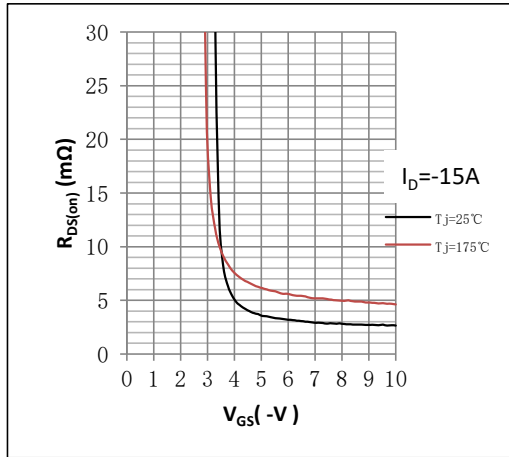


Fig.8 Normalized drain-source on-state resistance factor as a function of junction temperature;Typical values
Normalized On-Resistance= $R_{DS(on)}/R_{DS(on)}(25^{\circ}\text{C})$

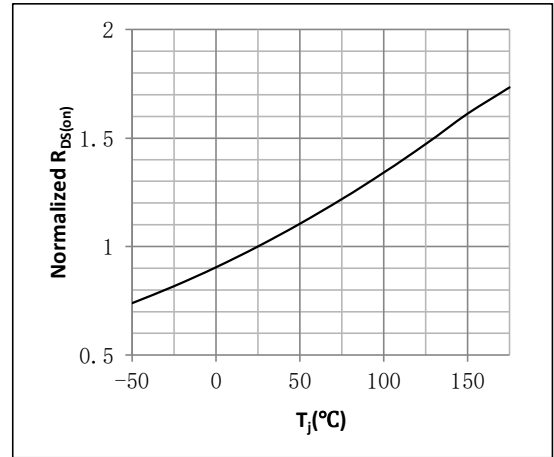


Figure 9. Source (diode forward) current as a function of source-drain (diode forward) voltage ;Typical values

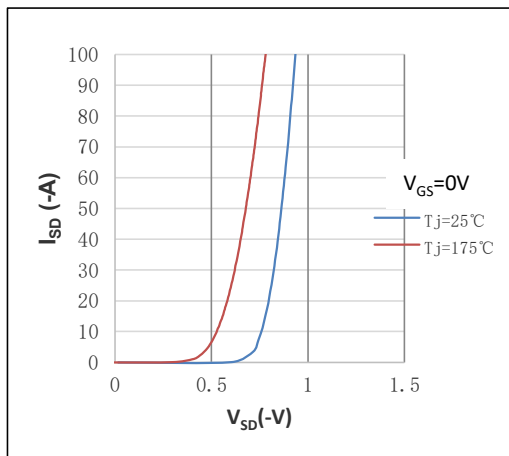


Figure 10. Transfer characteristics: drain current as a function of gate-source voltage;Typical values

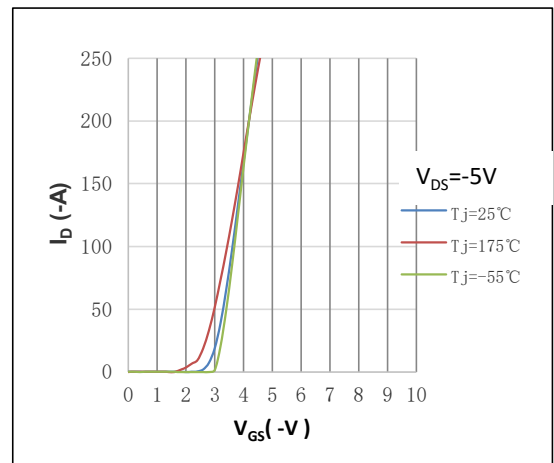


Fig.11 Safe operating area: continuous and peak drain currents as a function of drain-source voltage;Calculative values

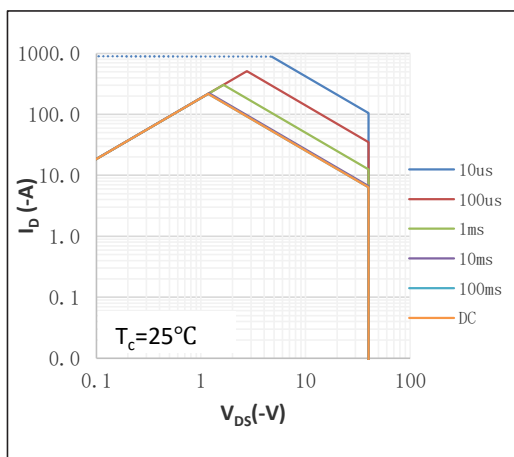


Fig.12 Continuous drain current as a function of case temperature[®];Calculative values

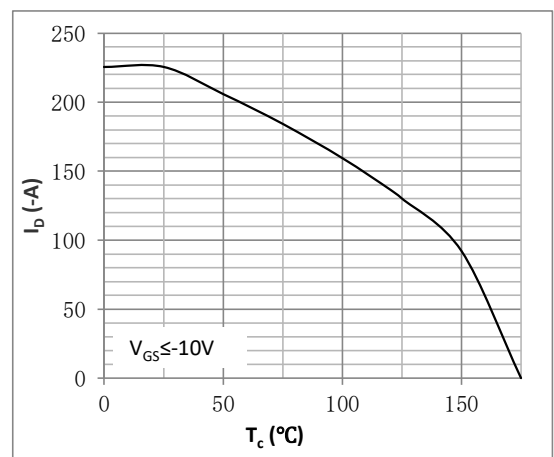


Fig.13 Drain-source breakdown voltage as a function of junction temperature; Typical values
Normalized BVDSS=BVDSS/BVDSS(25°C)

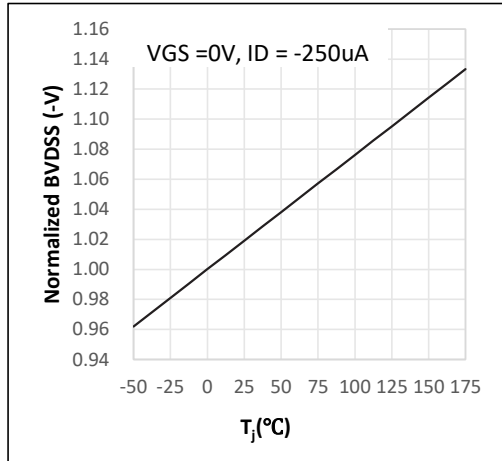


Fig.14 Normalized total power dissipation as a function of case temperature; Calculative values
Normalized Power Dissipation= $P_d/P_d(25^\circ C)$

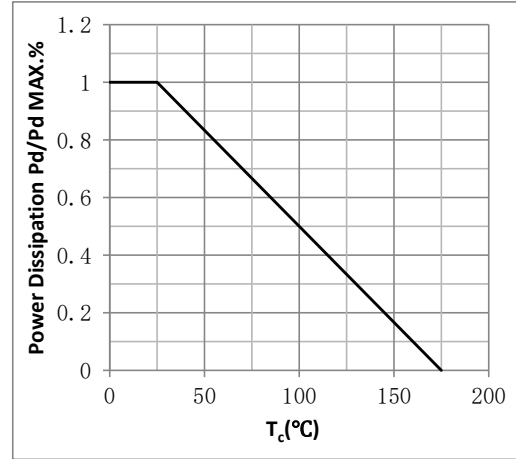
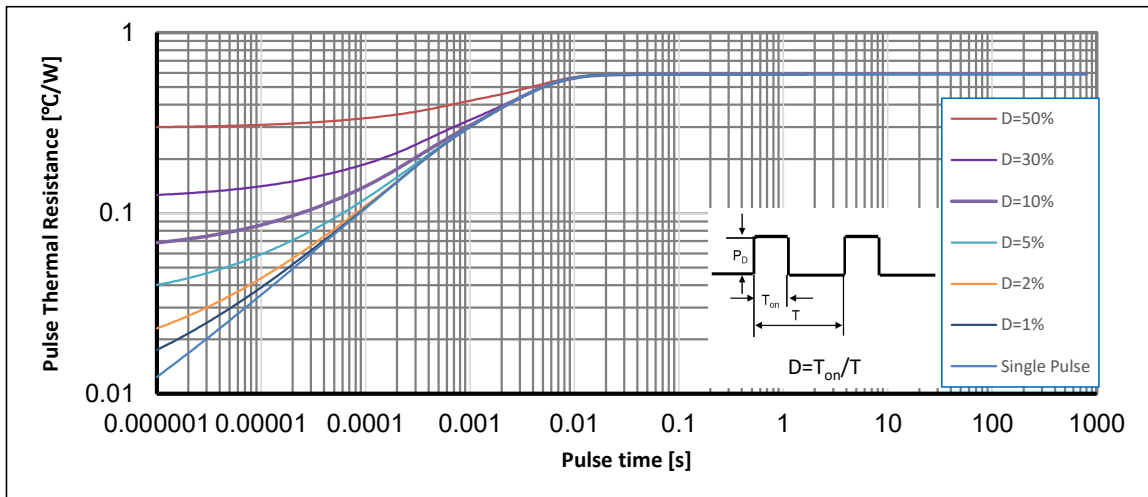
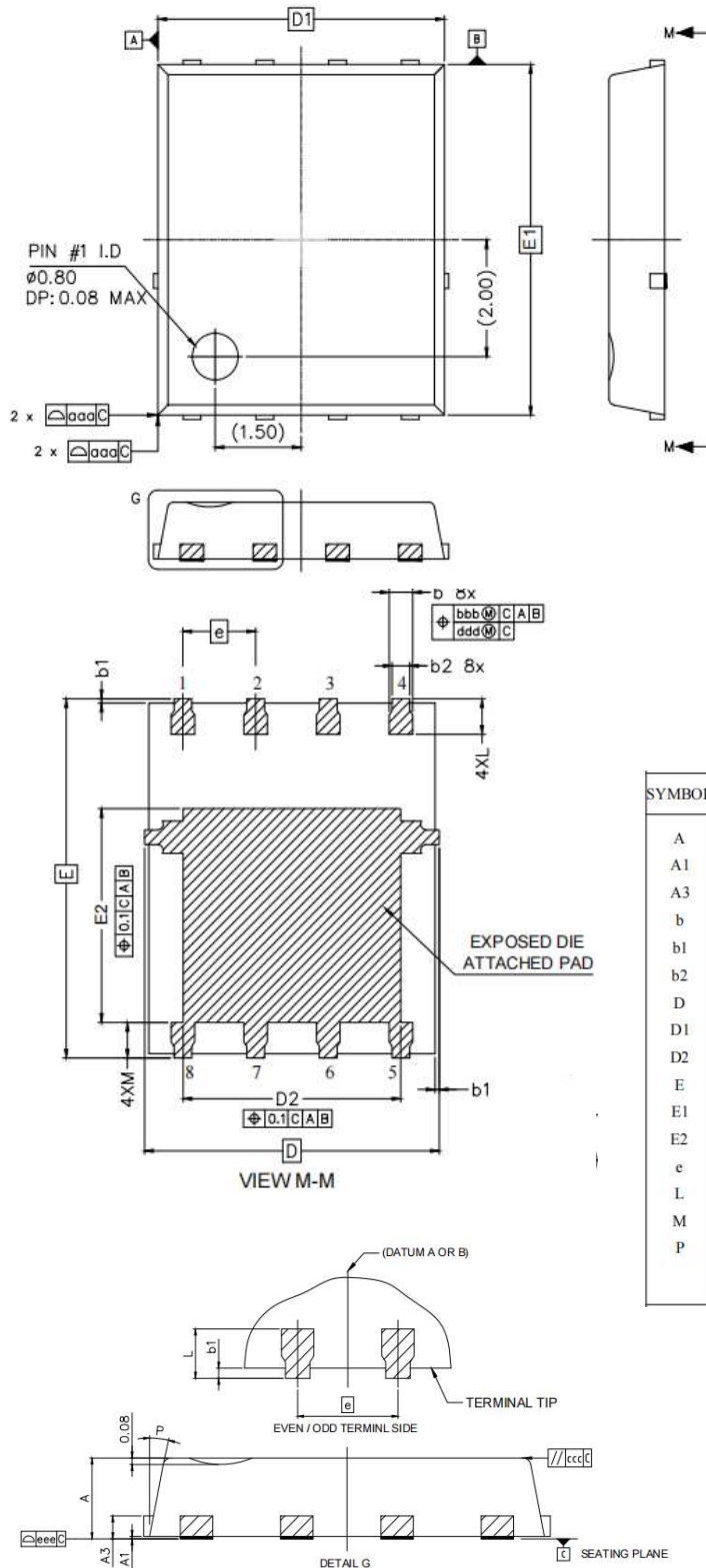


Fig.15 Transient thermal impedance from junction to case as a function of pulse duration; max values



•DFN5*6 Package Outline



SYMBOL	MIN	MAX	SYMBOL	MIN	MAX
A	0.95	1.05	aaa	0.10	
A1	0.00	0.05	bbb	0.10	
A3	0.25 REF		ccc	0.10	
b	0.31	0.51	ddd	0.05	
b1	0.03	0.13	eee	0.08	
b2	0.21	0.41			
D	5.15 BSC				
D1	5.00 BSC				
D2	3.70	3.90			
E	6.15 BSC				
E1	6.00 BSC				
E2	3.56	3.76			
e	1.27 BSC				
L	0.51	0.71			
M	0.51	0.71			
P	10°	12°			

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. VGS=-10V.

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Revision History

Version	Date	Change
A	2025/4/8	New