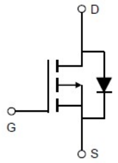
-500V P-Channel Plannar Power MOSFET

• General Description

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

• Product Summary



V_{DS}= -500V

$R_{DS(ON)}$ = 3000mΩ

I_D= -4.7A

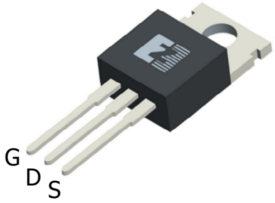
• Features

■AEC-Q101 Qualified

■Low $R_{DS(ON)}$ to minimize conductive loss

■High GOX reliability

■Low Thermal resistance



TO-220

•Application

■BLDC Motor driver

■DC-DC

■Load Switch

RoHS

REACH COMPLIANT

HF

•Ordering Information:

Part NO.	ZMPA02P50P
Marking	ZMP02P50
Packing Information	TUBE BULK
Basic ordering unit (pcs)	1000

•Absolute Maximum Ratings (T$_C$=25°C,unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Max.	Unit
Drain-Source Voltage	V_{DS}		-	-500	V
Gate-Source Voltage	V_{GS}		-20	20	V
Continuous Drain Current	I_D	VGS=-10V,T_C=25°C	-	-4.7	A
	I_D	VGS=-10V,T_C=75°C	-	-3.8	A
	I_D	VGS=-10V,T_C=100°C	-	-3.3	A
Pulsed Drain Current	I_{DM}	Pulsed; $t_p \leqslant$ 10 μs; T_C = 25 °C;	-	-18.8	A
Total Power Dissipation	P_D	T_C=25°C	-	167	W
Total Power Dissipation	P_D	T_A=25°C	-	2.4	W
Operating Junction Temperature	T_J		-55	175	℃
Storage Temperature	T_{STG}		-55	175	℃
Single Pulse Avalanche Energy	E_{AS}	L=5mH, V_{GS}=-10V, Rg=25Ω,	-	160	mJ
ESD Level (HBM)	CLASS 2				

•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction-case	R_{thJC}	-	-	0.9	°C/W
Thermal resistance, junction-ambient①	R_{thJA}	-	-	62	°C/W
Soldering temperature	Tsold	-	-	260	°C

•Electronic Characteristics (Tj=25°C,unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS} =0V, I_D = -250uA	-500	-	-	V
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS}=V_{DS}, I_D=-250uA	-3	-4.3	-5	V
Drain-Source Leakage Current	I_{DSS}	V_{GS}=0V, V_{DS}=-500V,T_j=25°C	-	-	-1.0	uA
		V_{GS}=0V, V_{DS}=-500V,T_j=175°C	-	-	-100	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=-2A,T_j=25°C	-	3000	3600	mΩ
		V_{GS}=-10V, I_D=-2A,T_j=175°C	-	7123	-	mΩ
Forward Transconductance	g_{FS}	V_{DS} =-20V, I_D = -2A	-	4.3	-	S
Diode Forward Voltage	V_{FSD}	V_{GS} =0V, I_{SD} = -2A	-	-	-1.3	V

•Dynamic characteristics (Tj=25°C,unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	Ciss	f = 1MHz, V_{DS}=-250V,V_{GS}=0V	-	848	-	pF
Output capacitance	Coss		-	30	-	
Reverse transfer capacitance	Crss		-	4	-	
Gate Risistance	Rg	f = 1MHz,V_{GS}=0V	-	10	-	Ω
Total gate charge	Qg	V_{DD} = -250V, I_D = -2A, V_{GS} = -10V	-	15.6	-	nC
Gate - Source charge	Qgs		-	4.8	-	
Gate - Drain charge	Qgd		-	5.0	-	
Turn-ON Delay time	$t_{D(on)}$	V_{GS}=-10V, V_{DS}=-250V, R_G =3.3Ω, I_D =-2A	-	16	-	ns
Turn-ON Rise time	t_r		-	73	-	ns
Turn-Off Delay time	$t_{D(off)}$		-	46	-	ns
Turn-Off Fall time	t_f		-	59	-	ns
Reverse Recovery Time	t_{rr}	V_{DD}=-250V, dI_S/dt = 100A/us, I_S=-2A	-	351	-	ns
Reverse Recovery Charge	Q_{rr}		-	1950	-	nC

Fig.1 Gate-source voltage as a function of gate charge;Typical values;Tj=25°C

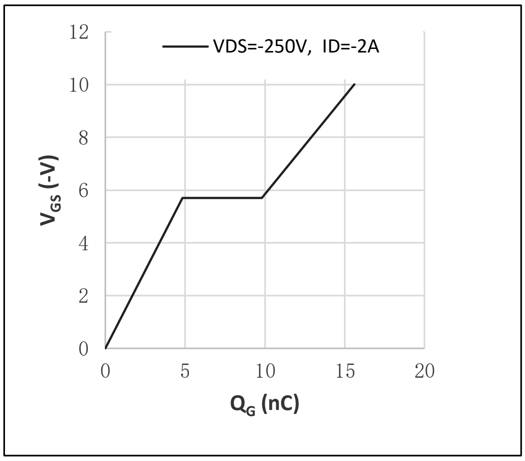


Fig.2 Input, output and reverse transfer capacitances as a function of drain-source voltage;Typical values;Tj=25°C

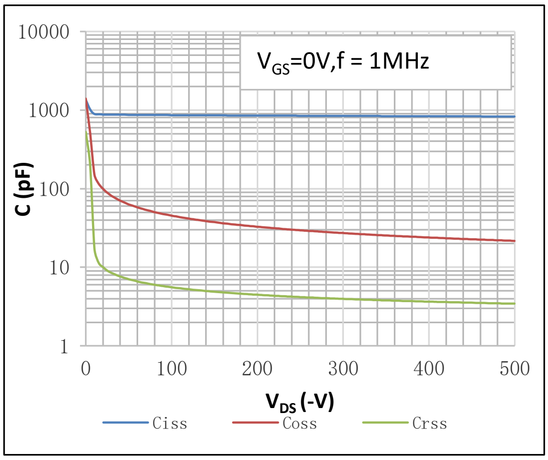


Fig.3 Output characteristics: drain current as a function of drain-source voltage;Typical values; Tj=25°C

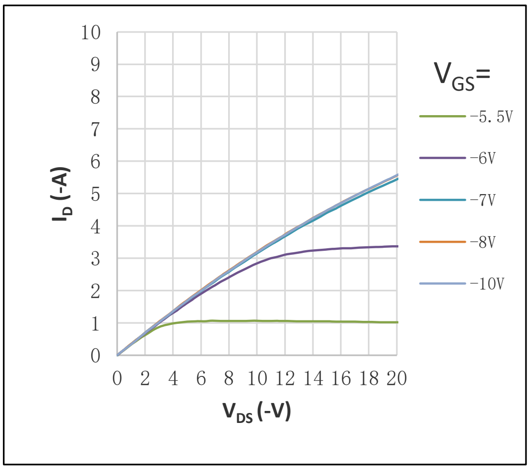


Fig.4 Output characteristics: drain current as a function of drain-source voltage;Typical values:Expanded curve;Tj=25°C

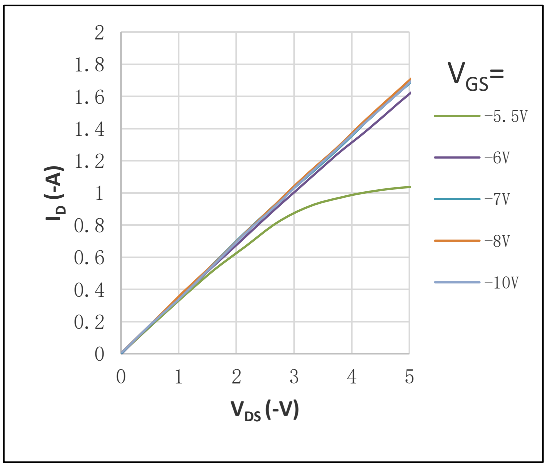


Fig.5 Gate-source threshold voltage as a function of junction temperature;Typical values

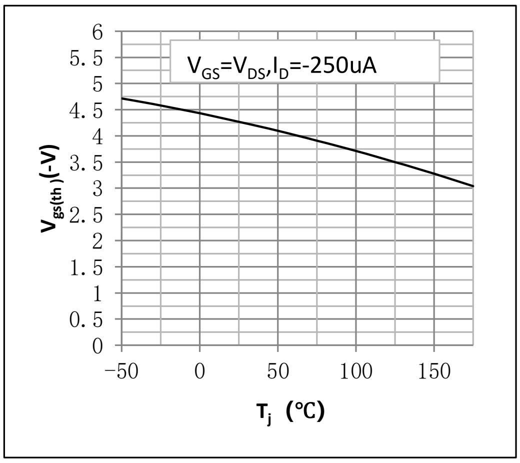


Fig.6 Drain-source on-state resistance as a function of drain current;Typical values;Tj=25°C

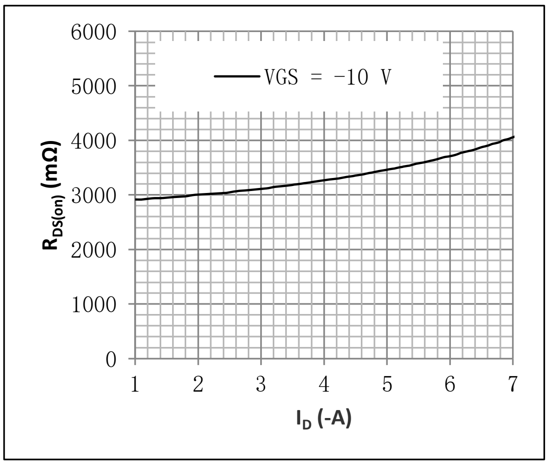


Fig.7 Drain-source on-state resistance as a function of gate-source voltage;Typical values

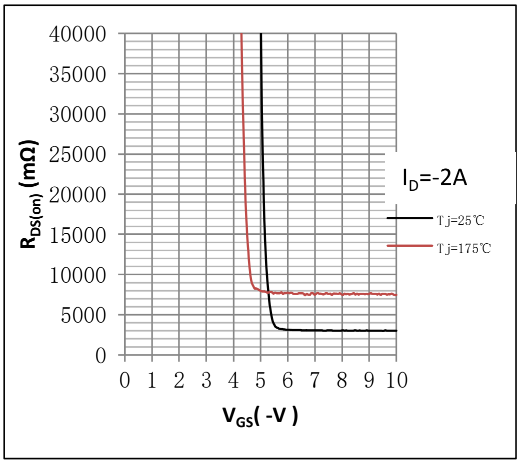


Fig.8 Normalized drain-source on-state resistance factor as a function of junction temperature;Typical values
Normalized On-Resistance=RDSon/RDSon(25 °C)

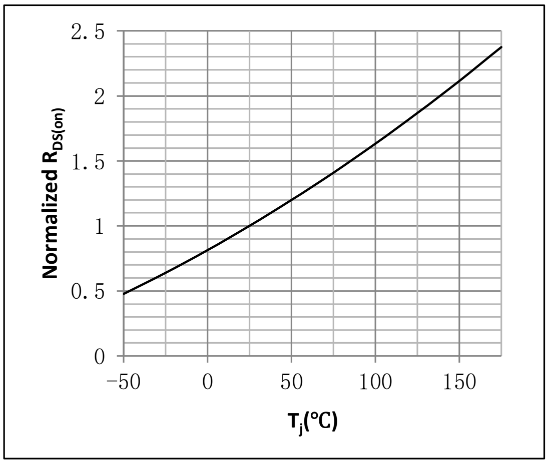


Figure 9. Source (diode forward) current as a function of source-drain (diode forward) voltage ;Typical values

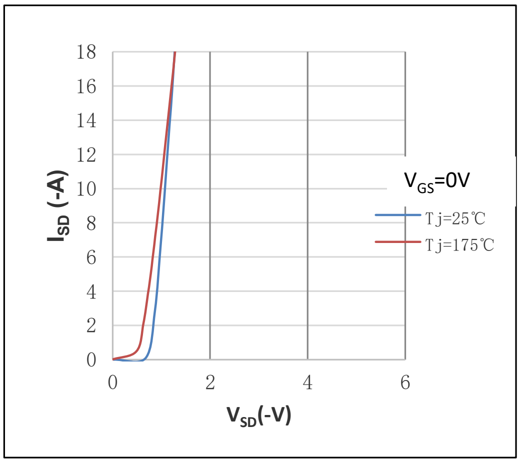


Figure 10. Transfer characteristics: drain current as a function of gate-source voltage;Typical values

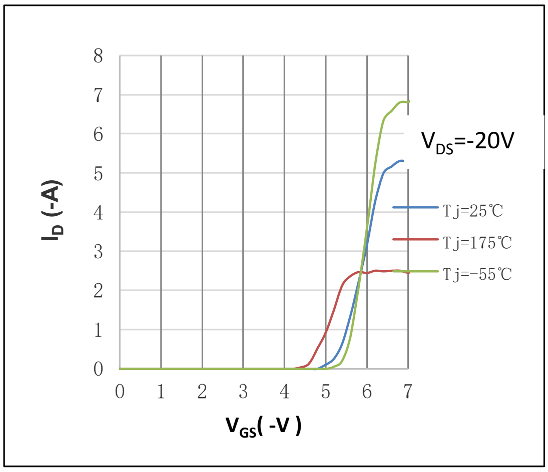


Fig.11 Safe operating area: continuous and peak drain currents as a function of drain-source voltage;Calculative values

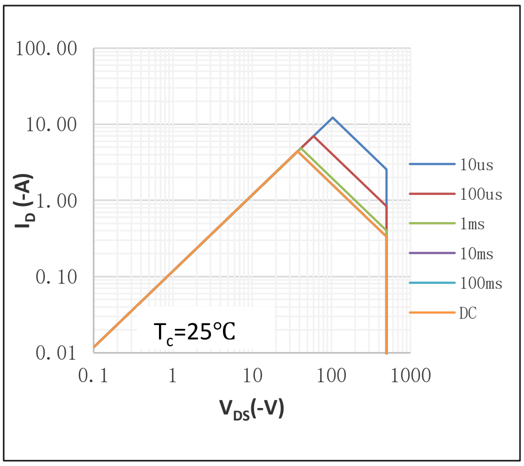


Fig.12 Continuous drain current as a function of case temperaturease[③] ;Calculative values

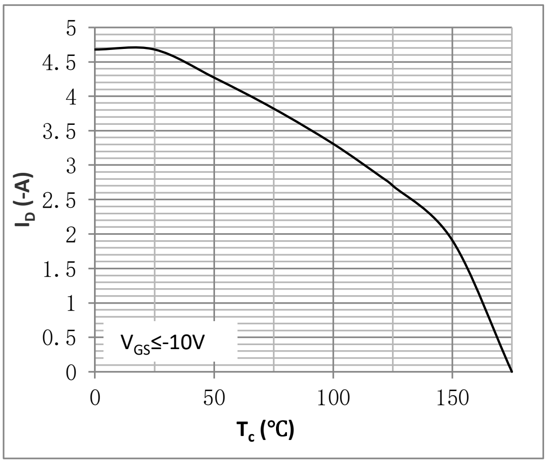


Fig.13 Drain-source breakdown voltage as a function of junction temperature;Typical values
Normalized BVDSS=BVDSS/BVDSS(25°C)

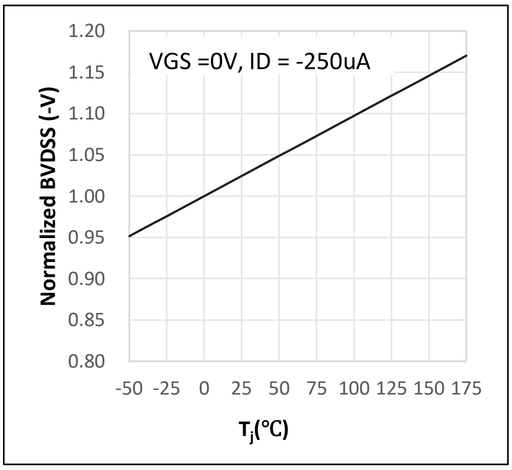


Fig.14 Normalized total power dissipation as a function of case temperature;Calculative values
Normalized Power Dissipation= Pd/Pd(25°C)

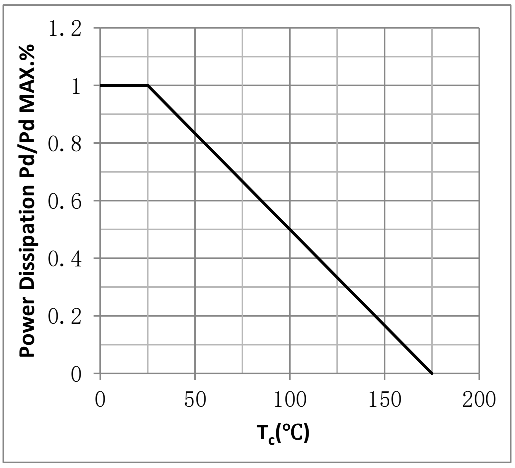
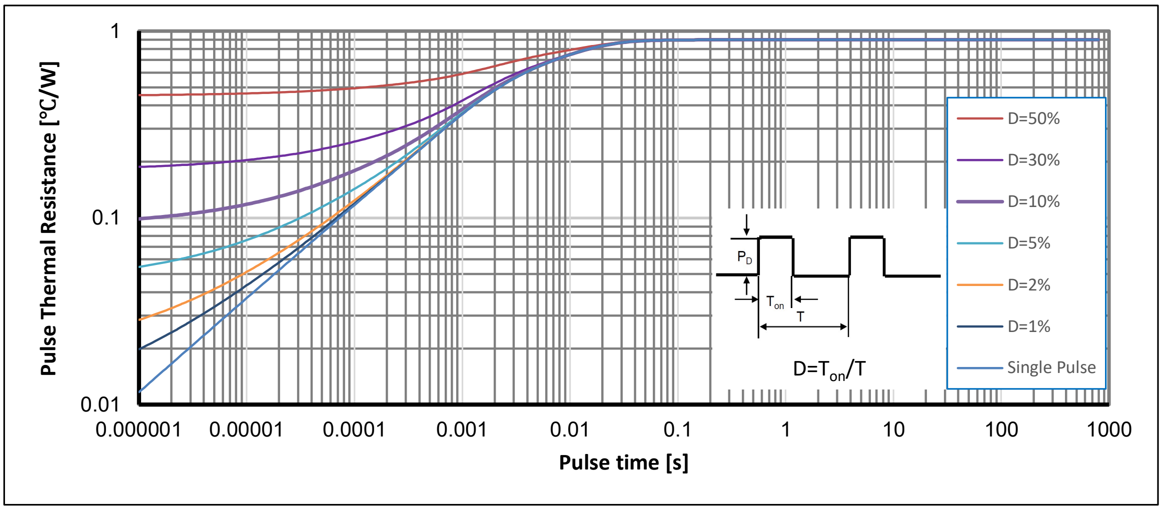
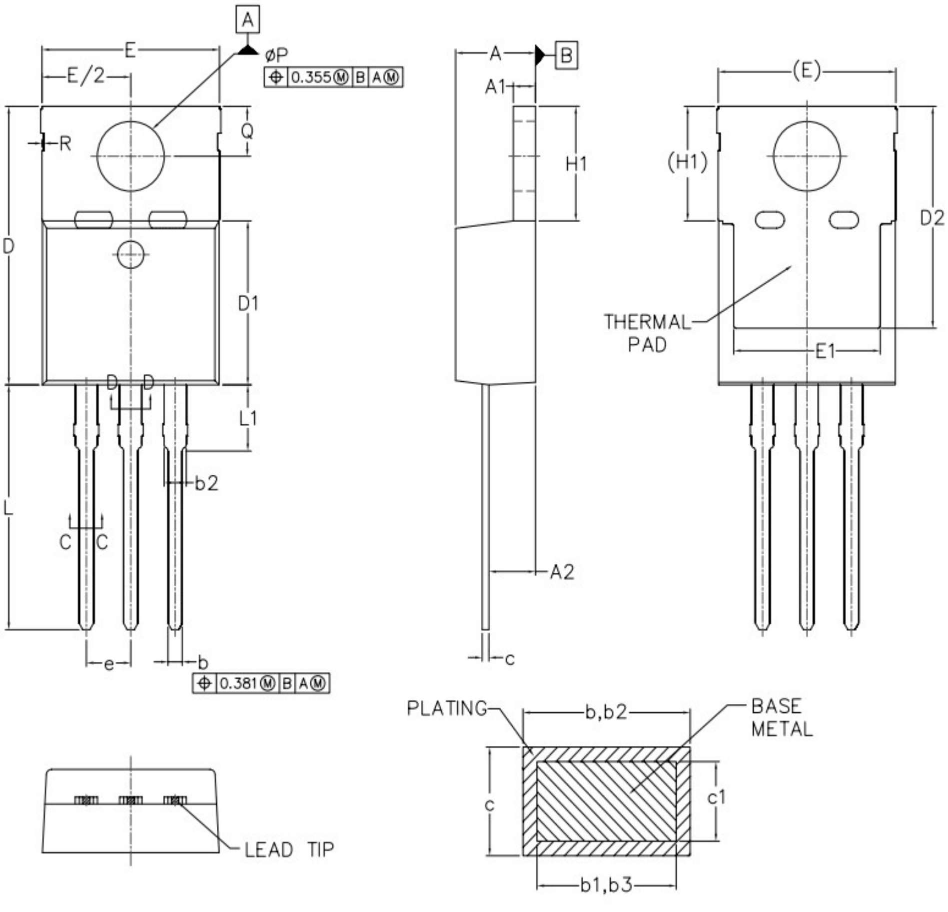


Fig.15 Transient thermal impedance from junction to case as a function of pulse duration; max values



●**TO-220 Package Outline**



SYMBOLS	COMMON	
	MM	
	MIN.	MAX.
A	3.556	4.826
A1	0.508	1.397
A2	2.032	2.921
b	0.381	1.016
b1	0.381	0.965
b2	1.143	1.778
b3	1.143	1.727
c	0.356	0.610
c1	0.356	0.559
D	14.224	16.510
D1	8.382	9.017
D2	12.042	12.878
E	9.652	10.668
E1	6.858	8.890
e	2.540 BSC.	
H1	5.842	6.858
L	12.700	14.732
L1	3.560	4.060
ØP	3.810	3.860
Q	2.540	3.048
R	0.127 BSC	

Note:

① Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate；

②Practically the current will be limited by PCB, thermal design and operating temperature. VGS=-10V.

Disclaimer

● Reproducing and modifying information of the document is prohibited without permission from ZMJ SEMICONDDUCTORS CO.,LTD.

● ZMJ SEMICONDDUCTORS CO.,LTD. reserves the rights to make changes of the content herein the document anytime without notification. Please refer to our website for the latest document.

● ZMJ SEMICONDDUCTORS CO.,LTD. disclaims any and all liability arising out of the application or use of any product including damages incidentally and consequentially occurred.

● ZMJ SEMICONDDUCTORS CO.,LTD. does not assume any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

● Applications shown on the herein document are examples of standard use and operation. Customers are responsible in comprehending the suitable use in particular applications. ZMJ SEMICONDDUCTORS CO.,LTD. makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

● The products shown herein are not designed and authorized for equipments relating to human life and for any applications concerning life-saving or life-sustaining, such as medical instruments, aerospace machinery et cetera. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify ZMJ SEMICONDDUCTORS CO.,LTD. for any damages resulting from such improper use or sale.

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

Revision History

Version	Date	Change
A	2025/6/21	New