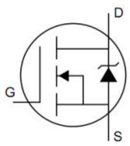
60V N-Channel Planar Power MOSFET

• General Description

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

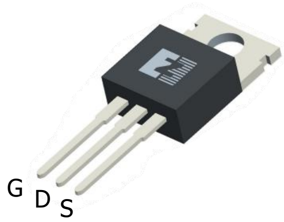
• Product Summary



V_{DS}= 60V

$R_{DS(ON)}$ = 4.3mΩ

I_D= 140A



TO-220

• 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.	ZMPA070N06P
Marking	ZMP070N06
Packing Information	TUBE
Basic ordering unit (pcs)	1000

•Absolute Maximum Ratings (T_C=25℃)

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DS}		60	V
Gate-Source Voltage①	V_{GS}		±20	V
Continuous Drain Current	I_D	T_C=25℃	140	A
	I_D	T_C=75℃	126	A
	I_D	T_C=100℃	109	A
Pulsed Drain Current	I_{DM}	Pulsed; t_p ≤ 10 μs; T_{mb} = 25 °C;	420	A
Total Power Dissipation	P_D	T_C=25℃	333	W
Total Power Dissipation	P_D	T_A=25℃	2.4	W
Operating Junction Temperature	T_J		-55 to +175	℃
Storage Temperature	T_{STG}		-55 to +175	℃
Single Pulse Avalanche Energy	E_{AS}	L=0.5mH, V_{GS}=10V, Rg=25Ω,	1200	mJ
ESD Level (HBM)	CLASS 2			

●Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}		-	0.45	°C/W
Thermal resistance, junction-ambient	R_{thJA}		-	62	°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	60			V
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} =V_{DS}, I_D =250uA	1.3	1.7	2.5	V
Drain-Source Leakage Current	I_{DSS}	V_{GS}=0V, V_{DS}= 60V			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		4.3	6.0	mΩ
Forward Transconductance	g_{FS}	V_{DS} =5V, I_{SD} = 10A		43		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	-	5530	-	pF
Output capacitance	Coss		-	1350	-	
Reverse transfer capacitance	Crss		-	480	-	
Gate Risistance	Rg	f = 1MHz	-	1.4		Ω
Total gate charge	Qg	V_{DD} = 15V, I_D = 20A, V_{GS} = 10V	-	185	-	nC
Gate - Source charge	Qgs		-	11	-	
Gate - Drain charge	Qgd		-	49	-	
Turn-ON Delay time	$t_{D(on)}$	V_{GS}=10V,V_{DS}=15V, R_G =3.3Ω, I_D =20A	-	22	-	ns
Turn-ON Rise time	t_r		-	76	-	ns
Turn-Off Delay time	$t_{D(off)}$		-	98	-	ns
Turn-Off Fall time	t_f		-	30	-	ns
Reverse Recovery Time	t_{RR}	V_{DD}=20V, dI_S/dt = 100A/us, I_S=50A	-	98	-	ns
Reverse Recovery Charge	Q_{RR}		-	255	-	nC

Fig.1 Gate-Charge Characteristics

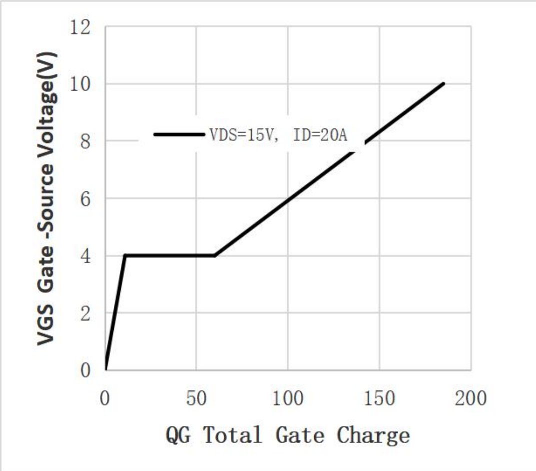


Fig.2 Capacitance Characteristics

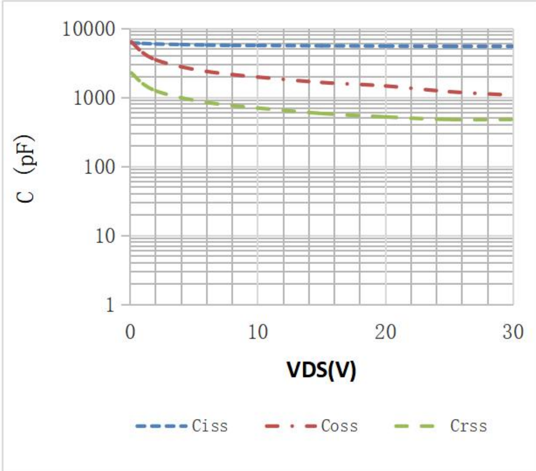


Fig.3 Power Dissipation

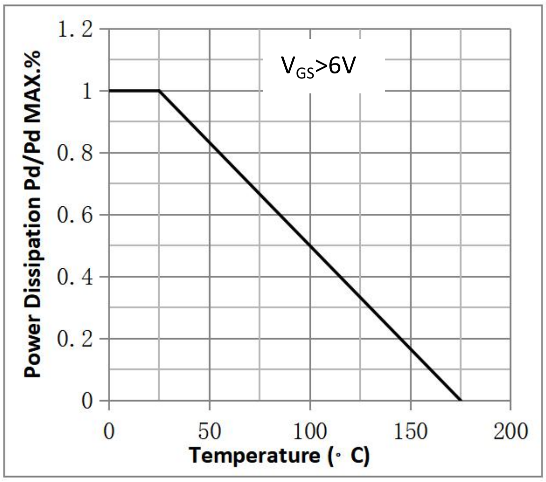


Fig.4 Typical output Characteristics

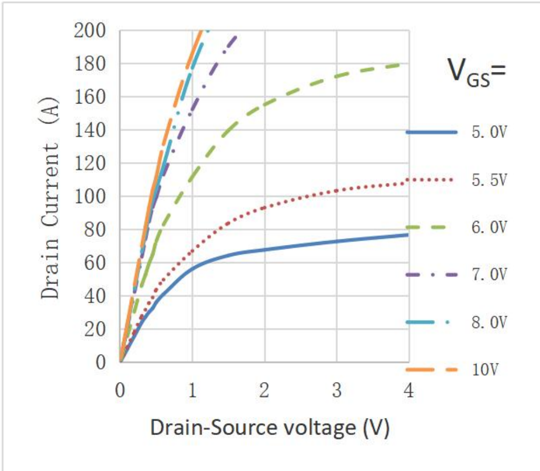


Fig.5 Threshold Voltage V.S Junction Temperature

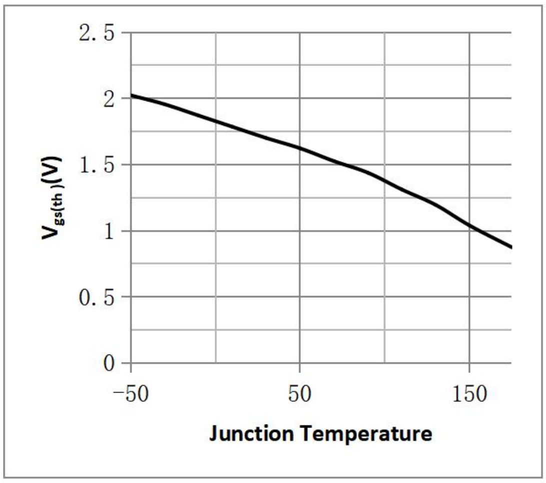


Fig.6 Resistance V.S Drain Current

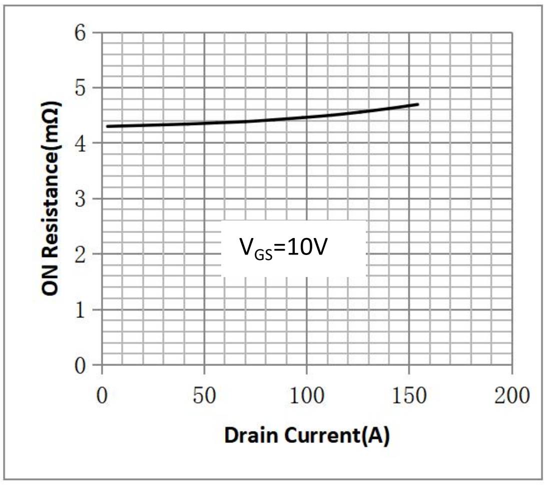


Fig.7 On-Resistance VS Gate Source Voltage

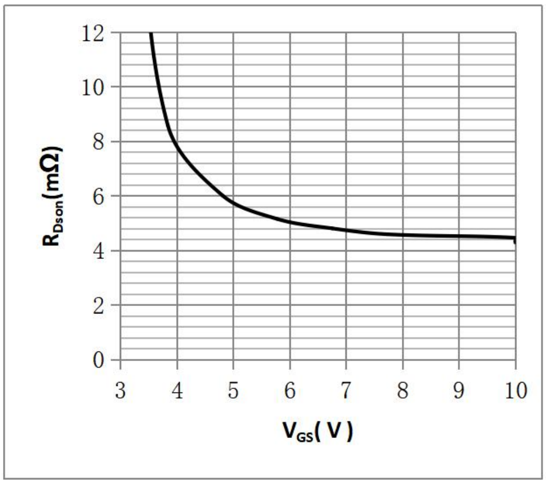


Fig.8 On-Resistance V.S Junction Temperature

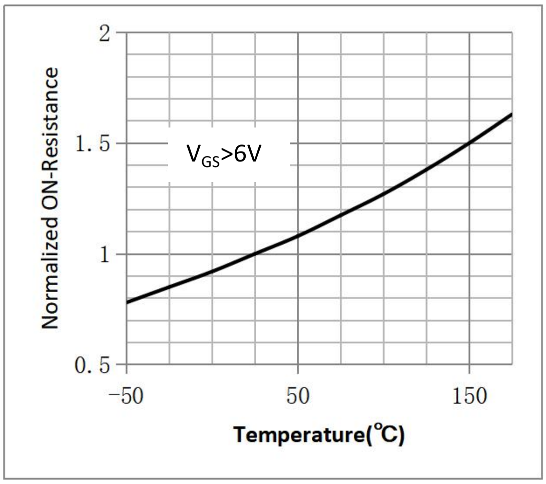


Figure 9. Diode Forward Voltage vs. Current

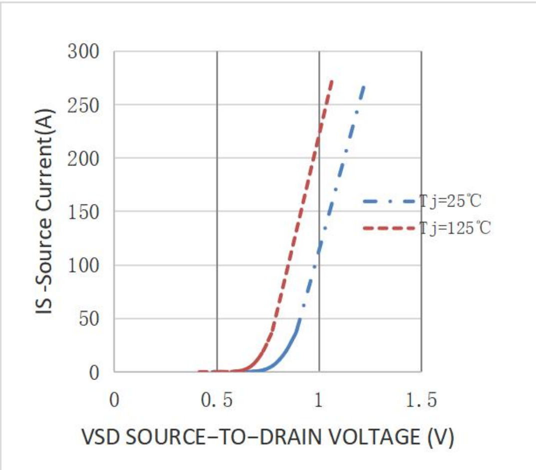


Figure 10. Transfer Characteristics

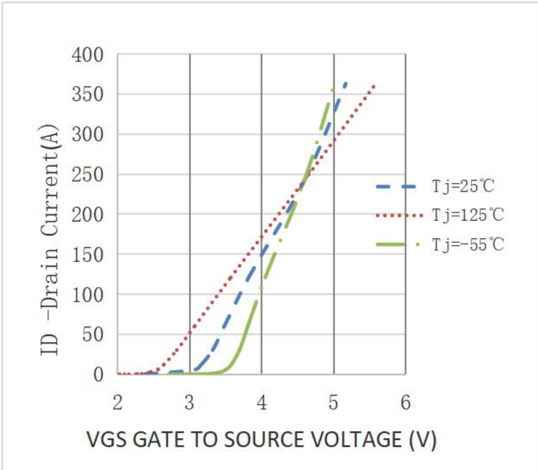


Fig.11 Safe Operating Area

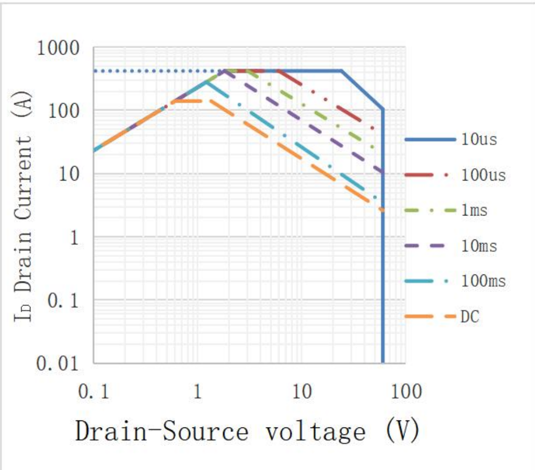
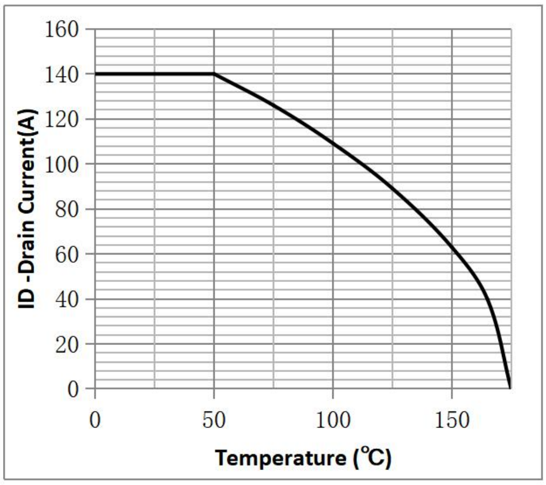
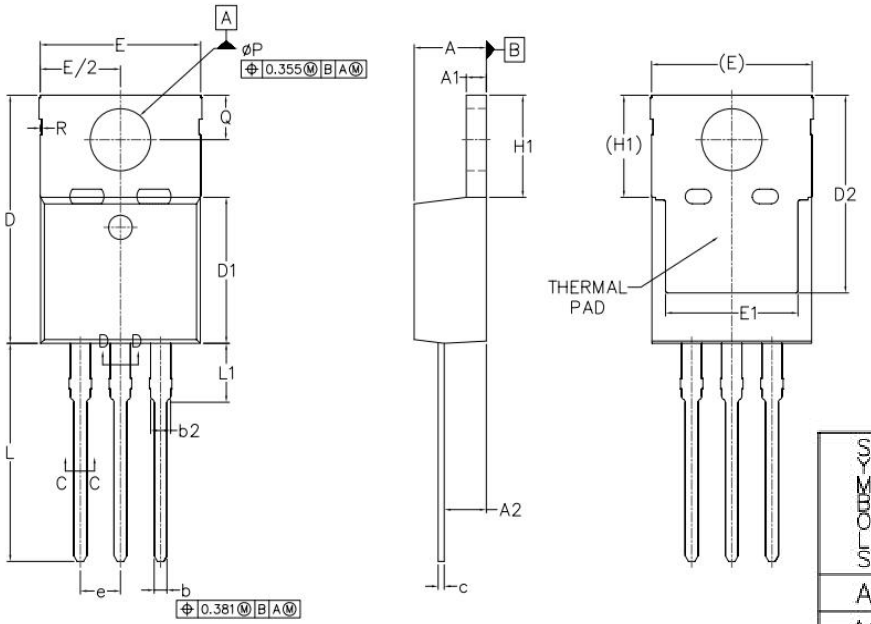
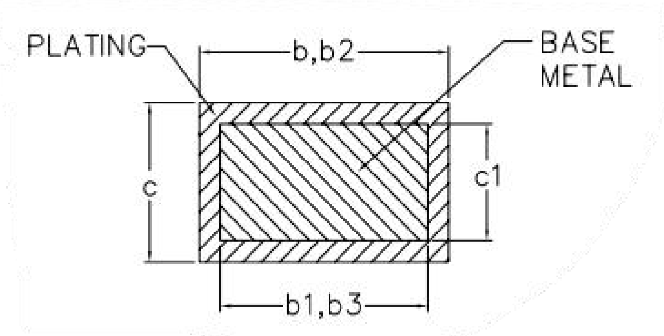


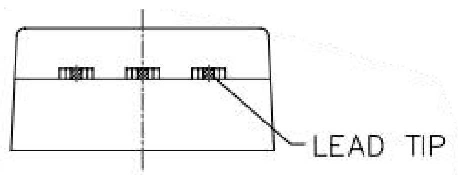
Fig.12 ID vs. Case Temperature②



●**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 Pulse : VGS=+20V/-20V, Duty cycle=50%,Tj=175℃, t=1000 hours; For DC， the following test conditions can be passed: VGS=+20V/-10V, Tj=175℃, t=1000 hours；

②Practically 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	2023.2.15	NEW
B	2023.9.19	Add Dynamic characteristics
C	2023.12.22	Correct Package Outline Dimension