

-60V P-Channel Power MOSFET

• General Description

It combines 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

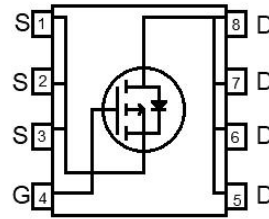
• Ordering Information:

Part NO.	ZMA420P06M
Marking	420P06
Packing Information	REEL TAPE
Basic ordering unit (pcs)	5000

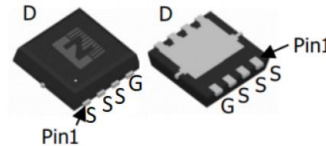
• Absolute Maximum Ratings ($T_C=25^\circ\text{C}$)

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DS}		-60	V
Gate-Source Voltage ^①	V_{GS}		±20	V
Continuous Drain Current	I_D	$T_C=25^\circ\text{C}$	-18	A
	I_D	$T_C=75^\circ\text{C}$	-15	A
	I_D	$T_C=100^\circ\text{C}$	-13	A
Pulsed Drain Current	I_{DM}	Pulsed; $t_p \leq 10 \mu\text{s}$; $T_{mb} = 25^\circ\text{C}$;	-72	A
Total Power Dissipation	P_D	$T_C=25^\circ\text{C}$	38	W
Total Power Dissipation	P_D	$T_A=25^\circ\text{C}$	2.5	W
Operating Junction Temperature	T_J		-55 to +175	°C
Storage Temperature	T_{STG}		-55 to +175	°C
Single Pulse Avalanche Energy	E_{AS}	L=0.1mH, $V_{GS}=-10\text{V}$, $R_g=25\Omega$,	33	mJ
		L=0.5mH, $V_{GS}=-10\text{V}$, $R_g=25\Omega$,	69.3	mJ
ESD Level (HBM)			CLASS 2	

• Product Summary



$V_{DS} = -60\text{V}$
 $R_{DS(ON)} = 42\text{m}\Omega$
 $I_D = -18\text{A}$



DFN3*3



•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}		-	4	°C/W
Thermal resistance, junction-ambient ^②	R_{thJA}		-	60	°C/W
Soldering temperature	T_{sold}		-	260	°C

•Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0V, I_D = -250\mu A$	-60			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}	$V_{GS} = 0V, V_{DS} = -60V$			1.0	μA
Gate- Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$			100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	$V_{GS} = -10V, I_D = -10A$		42	65	m Ω
		$V_{GS} = -4.5V, I_D = -8A$		60	85	m Ω
Forward Transconductance	g_{FS}	$V_{DS} = -5V, I_{SD} = -10A$		20		S
Diode Forward Voltage	V_{FSD}	$V_{GS} = 0V, I_{SD} = -10A$			1.3	V

•Dynamic characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	C_{iss}	$f = 1MHz, V_{DS} = -25V$	-	2090	-	pF
Output capacitance	C_{oss}		-	127	-	
Reverse transfer capacitance	C_{rss}		-	93	-	
Gate Resistance	R_g	$f = 1MHz$	-	8		Ω
Total gate charge	Q_g	$V_{DD} = -15V,$ $I_D = -10A,$ $V_{GS} = -10V$	-	35	-	nC
	$Q_g(-4.5v)$		-	21	-	
Gate - Source charge	Q_{gs}		-	4.6	-	
Gate - Drain charge	Q_{gd}		-	5.9	-	
Turn-ON Delay time	$t_{D(on)}$		$V_{GS} = -10V, V_{DS} = -15V,$ $R_G = 3.3\Omega, I_D = -10A$	-	24	
Turn-ON Rise time	t_r	-		18	-	ns
Turn-Off Delay time	$t_{D(off)}$	-		56	-	ns
Turn-Off Fall time	t_f	-		30	-	ns

Fig.1 Gate-Charge Characteristics

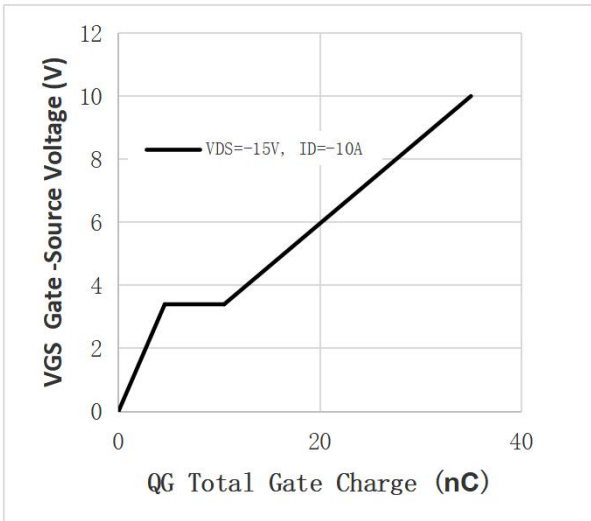


Fig.2 Capacitance Characteristics

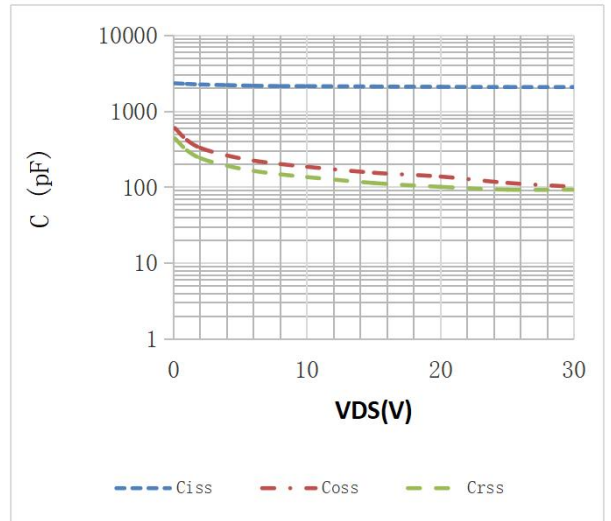


Fig.3 Power Dissipation

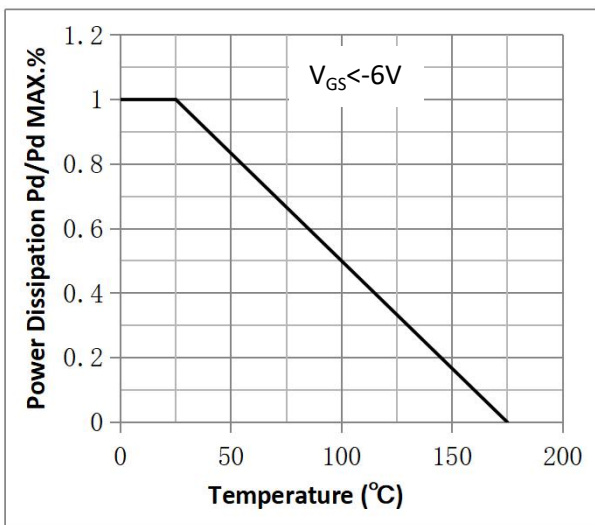


Fig.4 Typical output Characteristics

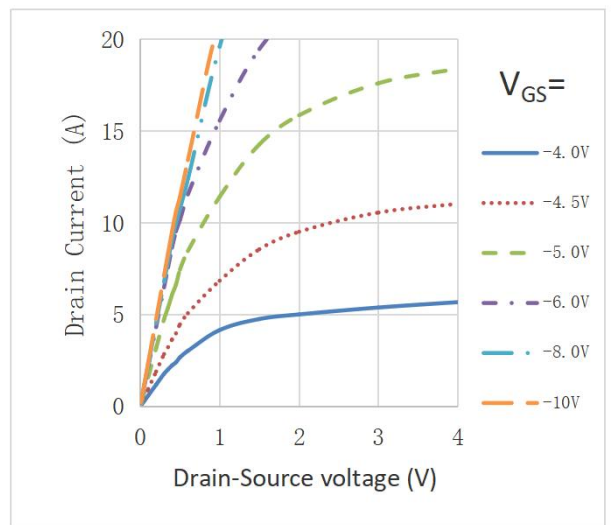


Fig.5 Threshold Voltage V.S Junction Temperature

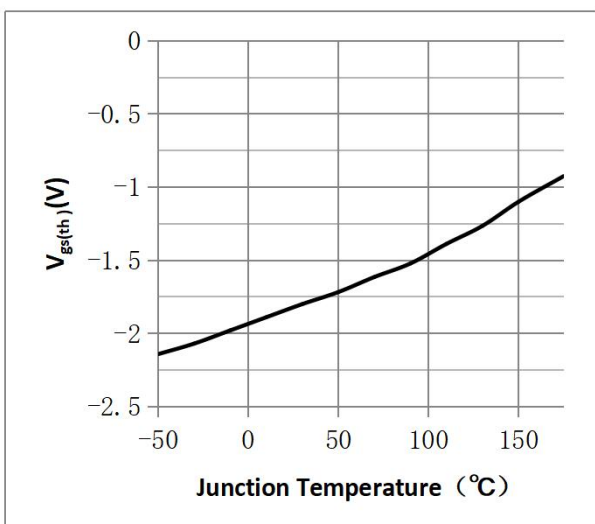


Fig.6 Resistance V.S Drain Current

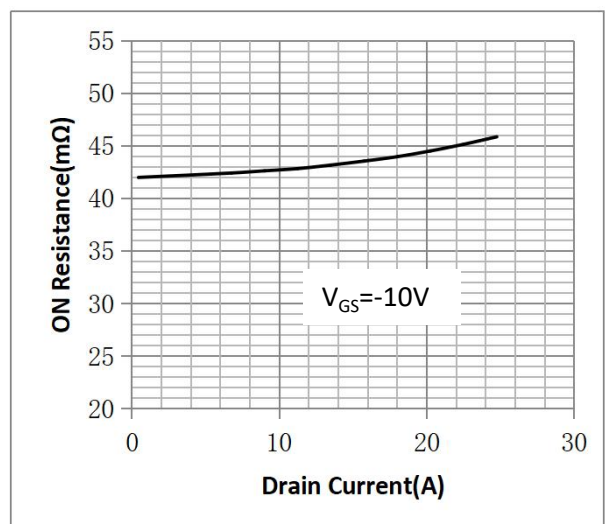


Fig.7 On-Resistance VS Gate Source Voltage

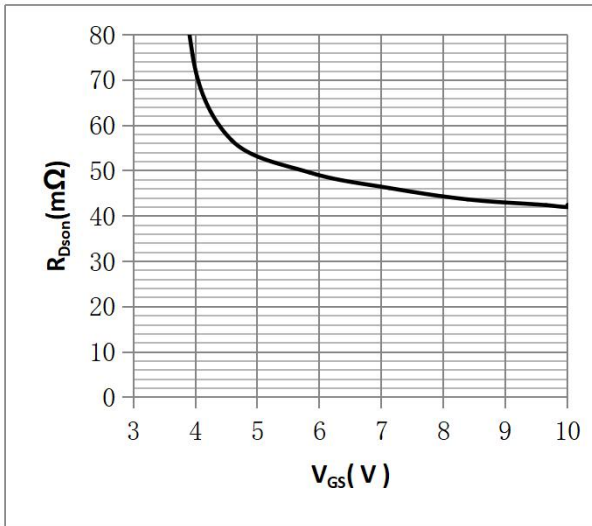


Fig.8 On-Resistance V.S Junction Temperature

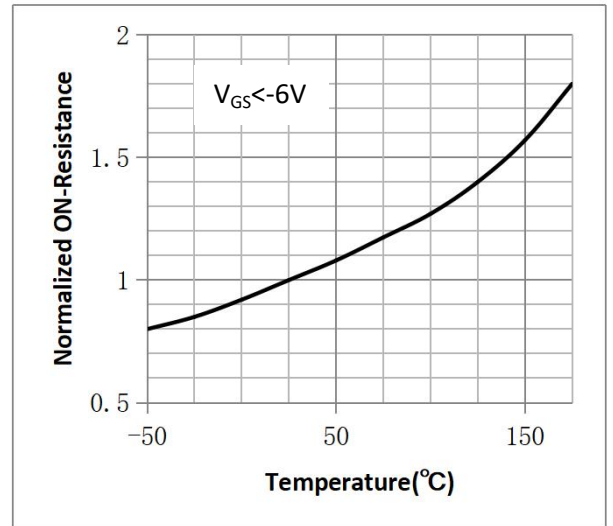


Figure 9. Diode Forward Voltage vs. Current

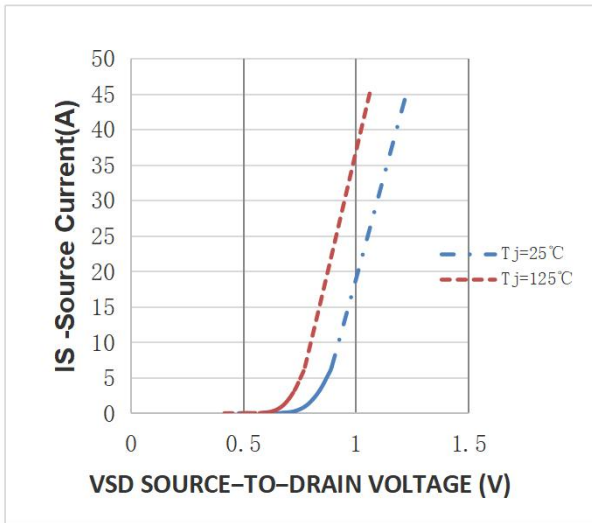


Figure 10. Transfer Characteristics

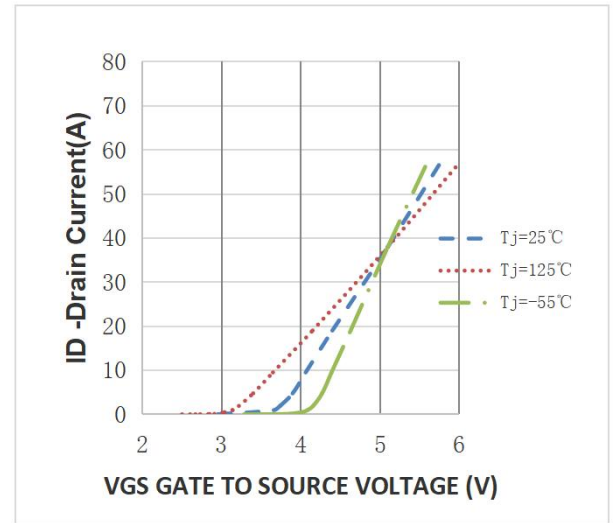


Fig.11 Safe Operating Area

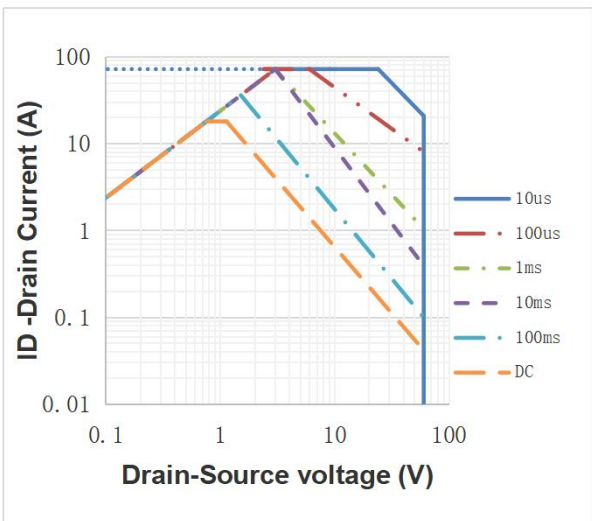
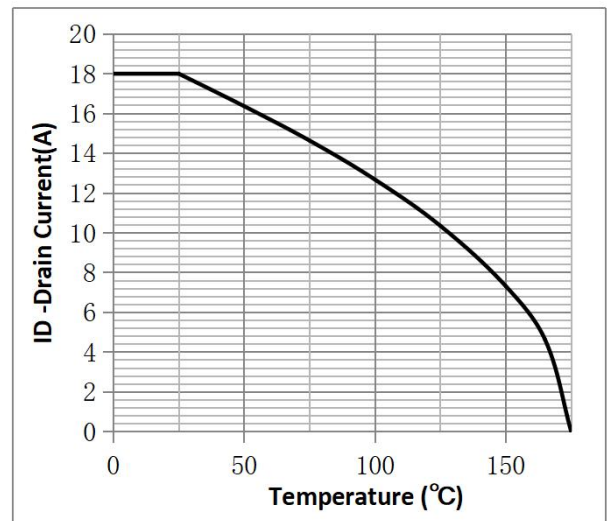
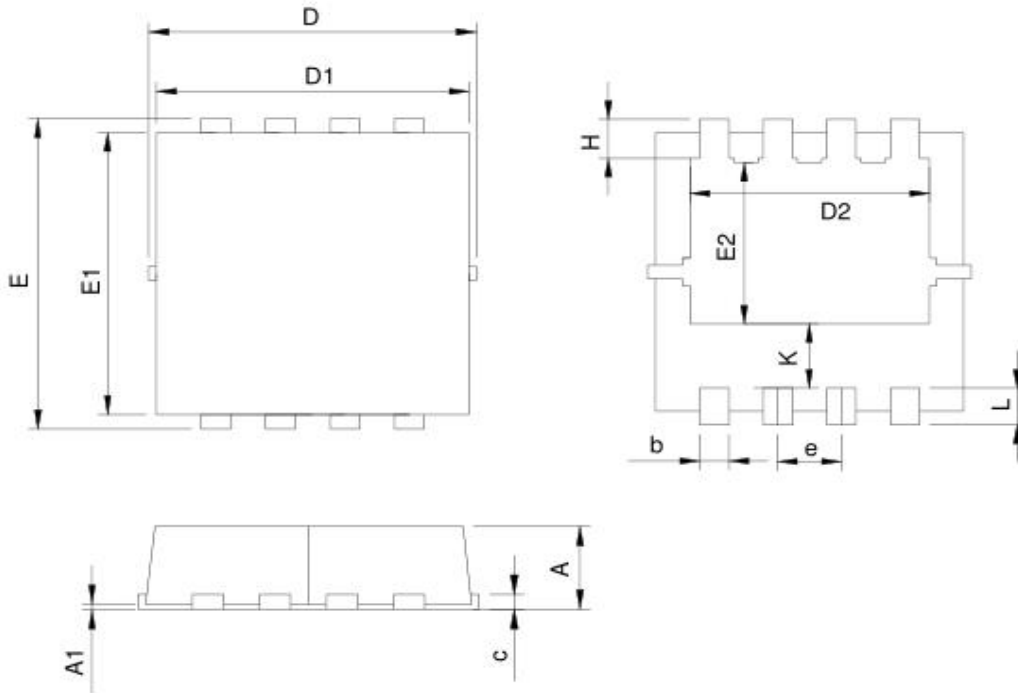


Fig.12 I_D vs. Case Temperature^③

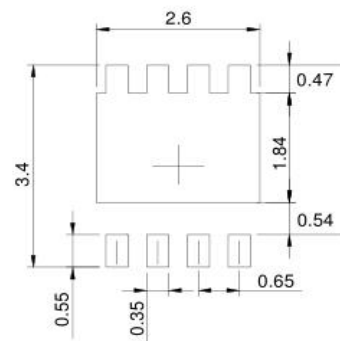


•DFN3*3 Package Outline



SYMBOL	DFN3.3x3.3-8			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	0.70	1.00	0.028	0.039
A1	0.00	0.05	0.000	0.002
b	0.25	0.35	0.010	0.014
c	0.14	0.20	0.006	0.008
D	3.10	3.50	0.122	0.138
D1	3.05	3.25	0.120	0.128
D2	2.35	2.55	0.093	0.100
E	3.10	3.50	0.122	0.138
E1	2.90	3.10	0.114	0.122
E2	1.64	1.84	0.065	0.072
e	0.65 BSC		0.026 BSC	
H	0.32	0.52	0.013	0.020
K	0.59	0.79	0.023	0.031
L	0.25	0.55	0.010	0.022

RECOMMENDED LAND PATTERN



UNIT: mm

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	2021.2.3	NEW
B	2022.9.7	1.Add Reach, HF figure