

• 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

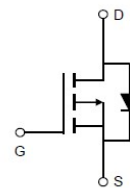
• Ordering Information:

Part NO.	ZMA020KP06D
Marking	ZM020KP06
Packing Information	REEL TAPE
Basic ordering unit (pcs)	2500

• 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	$T_C=25^\circ\text{C}$	-8	A
	I_D	$T_C=75^\circ\text{C}$	-7	A
	I_D	$T_C=100^\circ\text{C}$	-6	A
Pulsed Drain Current	I_{DM}	Pulsed; $t_p \leq 10 \mu\text{s}$; $T_{mb} = 25^\circ\text{C}$;	-24	A
Total Power Dissipation	P_D	$T_C=25^\circ\text{C}$	33	W
Total Power Dissipation	P_D	$T_A=25^\circ\text{C}$	2.4	W
Operating Junction Temperature	T_J		-55 to +175	$^\circ\text{C}$
Storage Temperature	T_{STG}		-55 to +175	$^\circ\text{C}$
Single Pulse Avalanche Energy	E_{AS}	$L=0.1\text{mH}$, $V_{GS}=-10\text{V}$, $R_g=25\Omega$,	1	mJ
		$L=0.5\text{mH}$, $V_{GS}=-10\text{V}$, $R_g=25\Omega$,	1.9	mJ
ESD Level (HBM)	CLASS 1B			

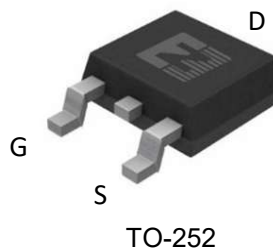
• Product Summary



$$V_{DS} = -60\text{V}$$

$$R_{DS(ON)} = 200\text{m}\Omega$$

$$I_D = -8\text{A}$$



•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}		-	4.5	°C/W
Thermal resistance, junction-ambient ^②	R_{thJA}		-	62	°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	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-4A$		200	250	m Ω
		$V_{GS}=-4.5V, I_D=-3A$		230	300	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=-5V, I_{SD}=-4A$		6		s
Diode Forward Voltage	V_{FSD}	$V_{GS}=0V, I_{SD}=-4A$			1.3	V

•Dynamic characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	C_{iss}	$f=1MHz, V_{DS}=-25V$	-	336	-	pF
Output capacitance	C_{oss}		-	49	-	
Reverse transfer capacitance	C_{rss}		-	36	-	
Gate Resistance	R_g	$f=1MHz$	-	7		Ω
Total gate charge	Q_g	$V_{DD}=-15V, I_D=-4A, V_{GS}=-10V$	-	7.2	-	nC
	$Q_g(-4.5v)$		-	5.2	-	
Gate - Source charge	Q_{gs}		-	1.6	-	
Gate - Drain charge	Q_{gd}		-	3	-	
Turn-ON Delay time	$t_{D(on)}$	$V_{GS}=-10V, V_{DS}=-15V, R_G=3.3\Omega, I_D=-4A$	-	6.5	-	ns
Turn-ON Rise time	t_r		-	8	-	ns
Turn-Off Delay time	$t_{D(off)}$		-	16.5	-	ns
Turn-Off Fall time	t_f		-	4	-	ns



Fig.1 Gate-Charge Characteristics

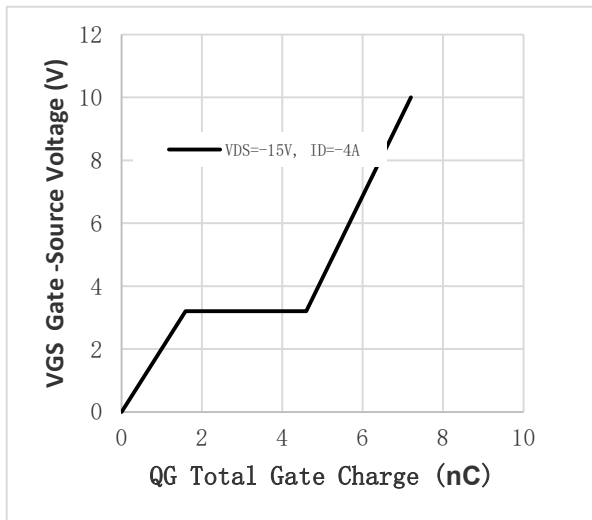


Fig.2 Capacitance Characteristics

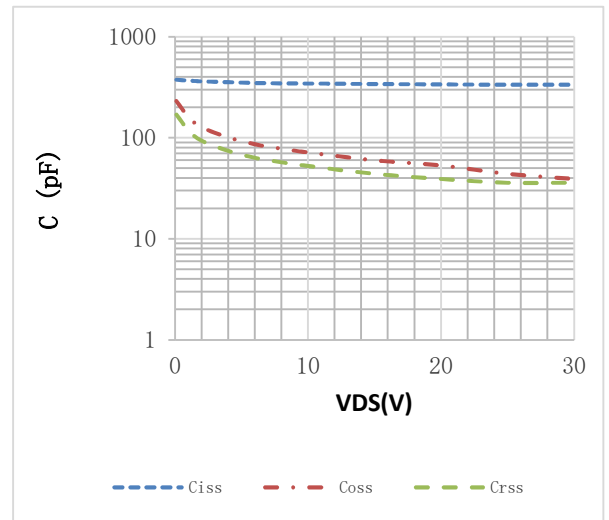


Fig.3 Power Dissipation

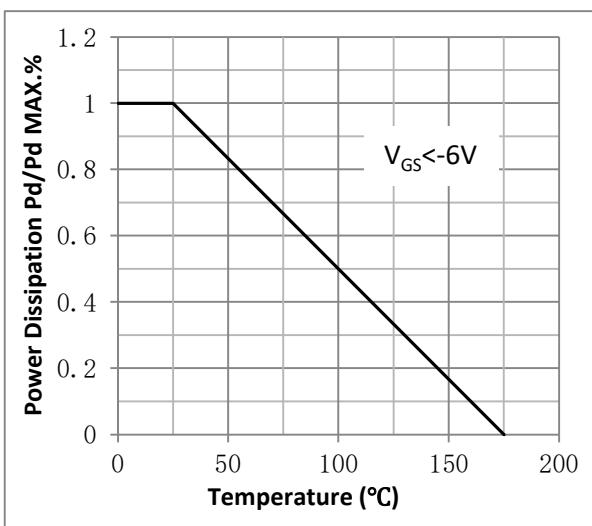


Fig.4 Typical output Characteristics

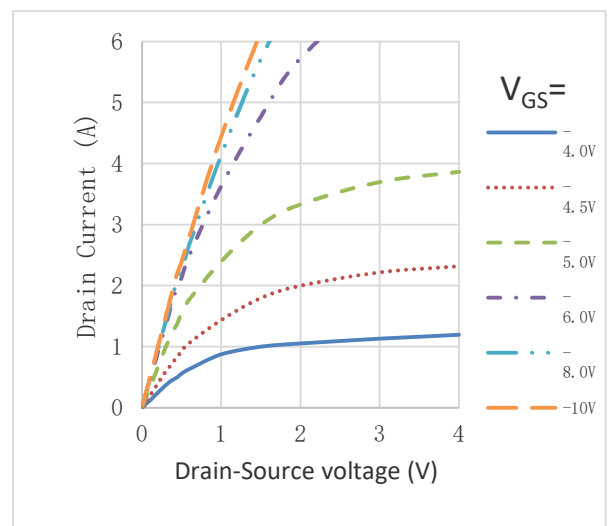


Fig.5 Threshold Voltage V.S Junction Temperature

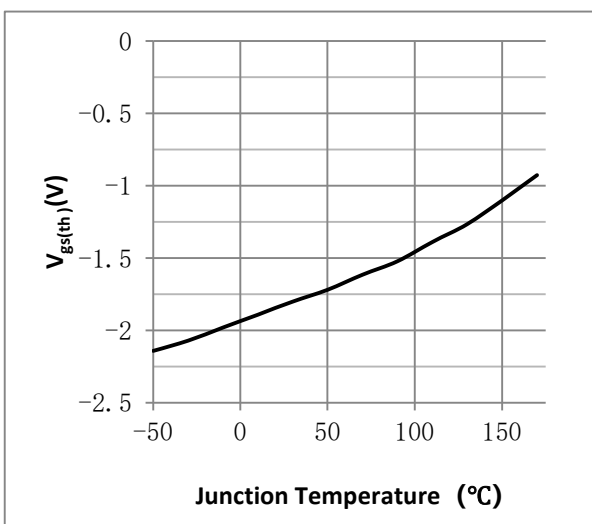


Fig.6 Resistance V.S Drain Current

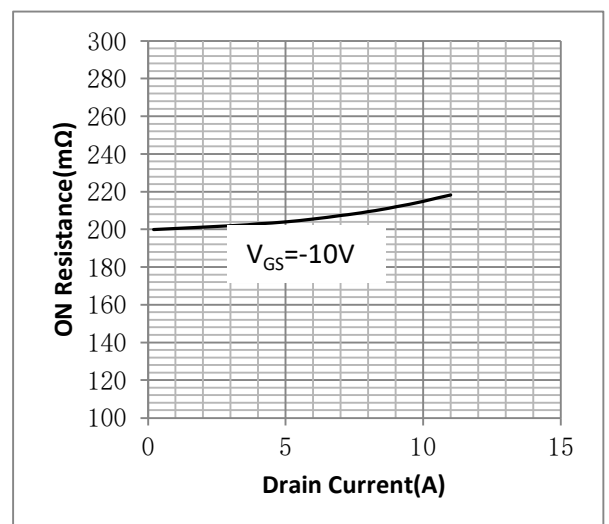


Fig.7 On-Resistance VS Gate Source Voltage

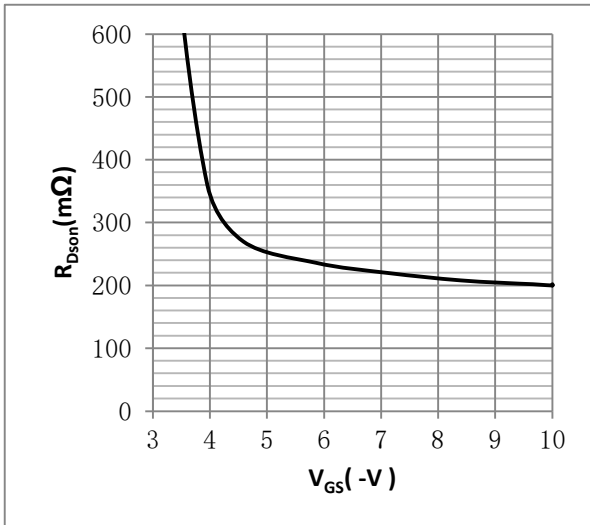


Fig.8 On-Resistance V.S Junction Temperature

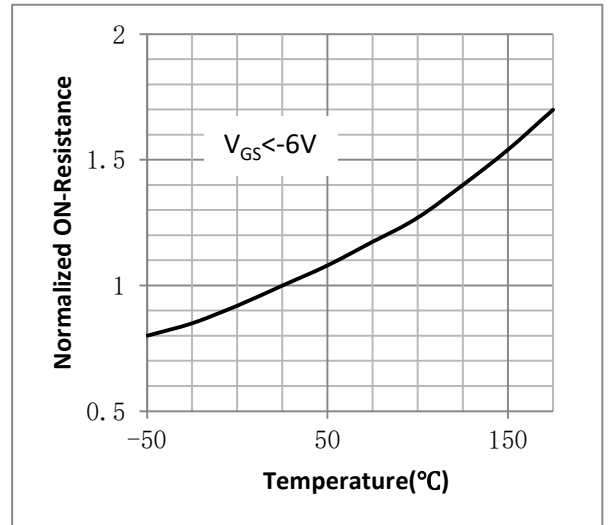


Figure 9. Diode Forward Voltage vs. Current

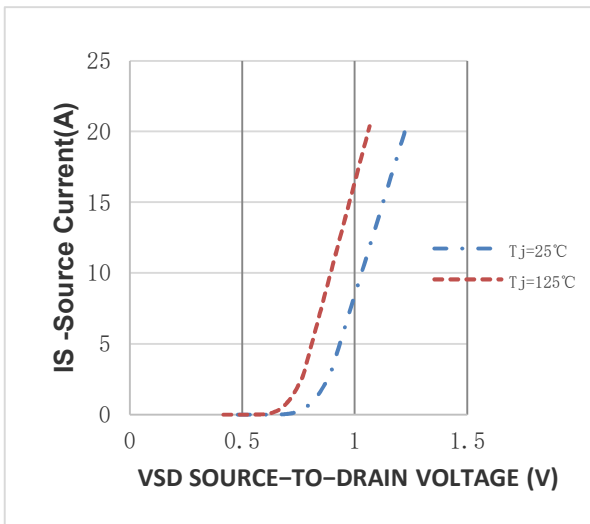


Figure 10. Transfer Characteristics

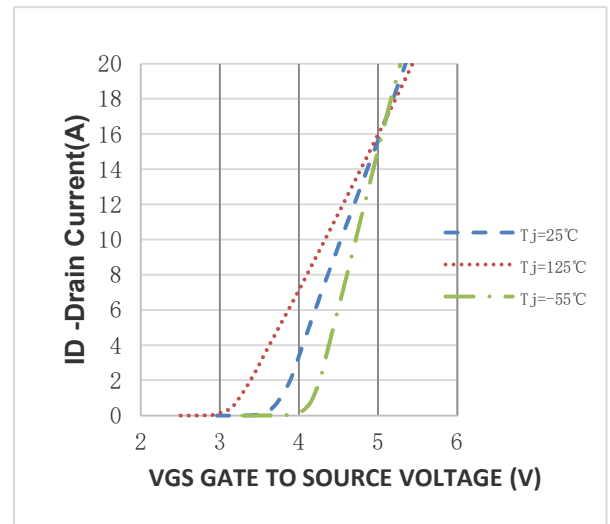


Fig.11 Safe Operating Area

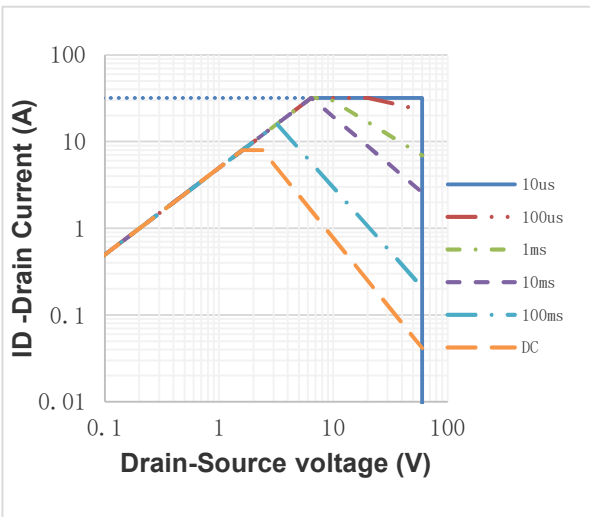
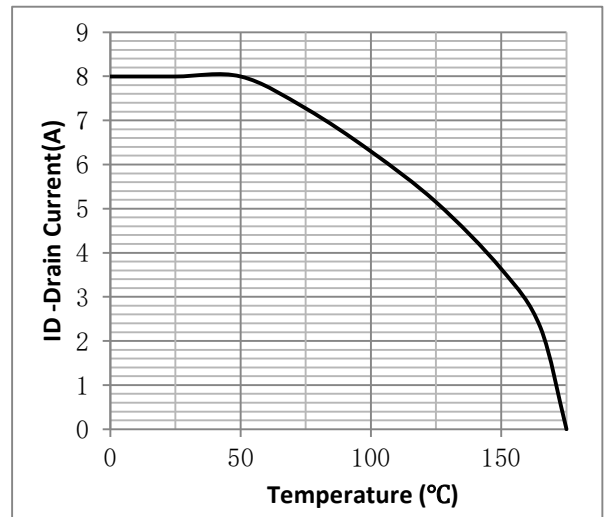
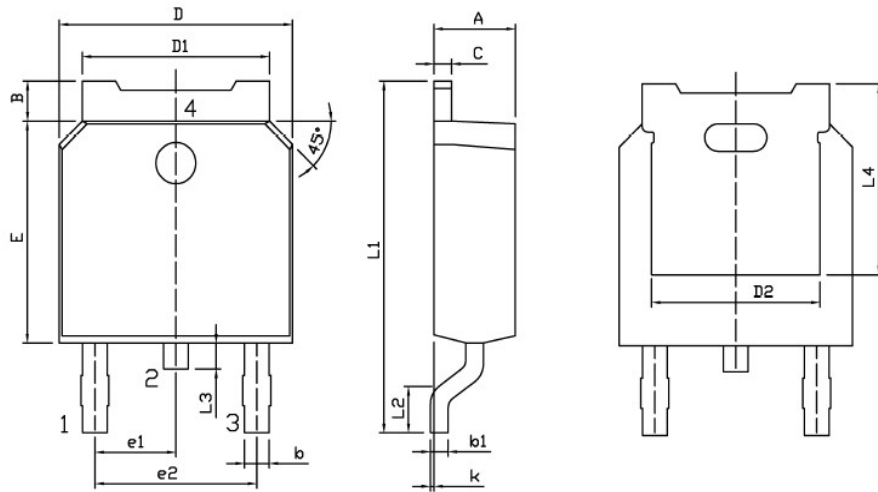


Fig.12 ID vs. Case Temperature^③

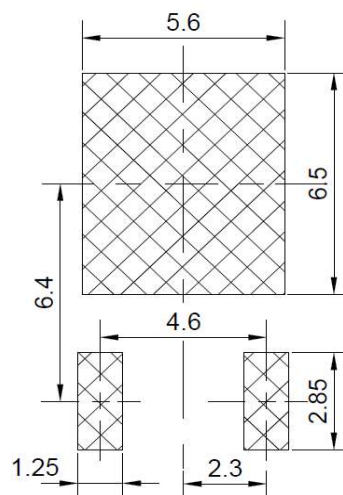


•TO-252 Package Outline



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

**Land Pattern
(Only for Reference)**



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	2022.12.15	NEW
B	2025.11.14	Update POD