

60V N-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
- Low Gate Charge for fast switching
- Low Thermal resistance

• Application

- BLDC Motor driver
- DC-DC
- Battery protection

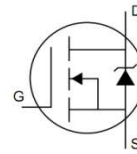
• Ordering Information:

Part NO.	ZMA010KN06T1
Marking	010KN06
Packing Information	REEL TAPE
Basic ordering unit (pcs)	3000

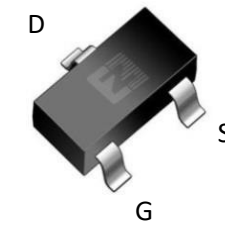
• Absolute Maximum Ratings ($T_C=25^\circ\text{C}$)

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DS}		60	V
Gate-Source Voltage	V_{GS}		± 20	V
Continuous Drain Current	I_D	$T_C=25^\circ\text{C}$	1.3	A
	I_D	$T_C=75^\circ\text{C}$	1.0	A
	I_D	$T_C=100^\circ\text{C}$	0.8	A
Pulsed Drain Current	I_{DM}	Pulsed; $t_p \leq 10 \mu\text{s}$; $T_{mb} = 25^\circ\text{C}$;	5.2	A
Total Power Dissipation	P_D	$T_C=25^\circ\text{C}$	1	W
Total Power Dissipation	P_D	$T_A=25^\circ\text{C}$	0.4	W
Operating Junction Temperature	T_J		-55 to +150	$^\circ\text{C}$
Storage Temperature	T_{STG}		-55 to +150	$^\circ\text{C}$
Single Pulse Avalanche Energy	E_{AS}	$L=0.1\text{mH}$, $V_{GS}=10\text{V}$, $R_g=25\Omega$,	5	mJ
		$L=0.5\text{mH}$, $V_{GS}=10\text{V}$, $R_g=25\Omega$,	10.5	mJ
ESD Level (HBM)	CLASS 1B			

• Product Summary



$V_{DS} = 60\text{V}$
 $R_{DS(ON)} = 124\text{m}\Omega$
 $I_D = 1.3\text{A}$



SOT-23(TO-236)



•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}		-	220	°C/W
Thermal resistance, junction-ambient ^①	R_{thJA}		-	300	°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	$R_{DS(ON)}$	$V_{GS}=10V, I_D=5A$		124	149	m Ω
		$V_{GS}=4.5V, I_D=3A$		149	224	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_{SD}=5A$		5		S
Diode Forward Voltage	V_{FSD}	$V_{GS}=0V, I_{SD}=5A$			1.3	V

•Dynamic characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	
Input capacitance	C_{iss}	$f=1MHz, V_{DS}=25V$	-	420	-	pF	
Output capacitance	C_{oss}		-	19.8	-		
Reverse transfer capacitance	C_{rss}		-	11.4	-		
Gate Resistance	R_g	$f=1MHz$	-	1		Ω	
Total gate charge	Q_g	$V_{DD}=15V, I_D=5A, V_{GS}=10V$	-	6.6	-	nC	
	$Q_g(4.5v)$		-	3.3	-		
	Gate - Source charge		Q_{gs}	-	1.5		-
	Gate - Drain charge		Q_{gd}	-	0.9		-
Turn-ON Delay time	$t_{D(on)}$	$V_{GS}=10V, V_{DS}=15V, R_G=3.3\Omega, I_D=5A$	-	7	-	ns	
Turn-ON Rise time	t_r		-	3	-	ns	
Turn-Off Delay time	$t_{D(off)}$		-	17	-	ns	
Turn-Off Fall time	t_f		-	3	-	ns	
Reverse Recovery Time	t_{RR}	$V_{DD}=20V, di_S/dt=100A/\mu s, I_S=5A$	-	21	-	ns	
Reverse Recovery Charge	Q_{RR}		-	24	-	nC	

Fig.1 Gate-Charge Characteristics

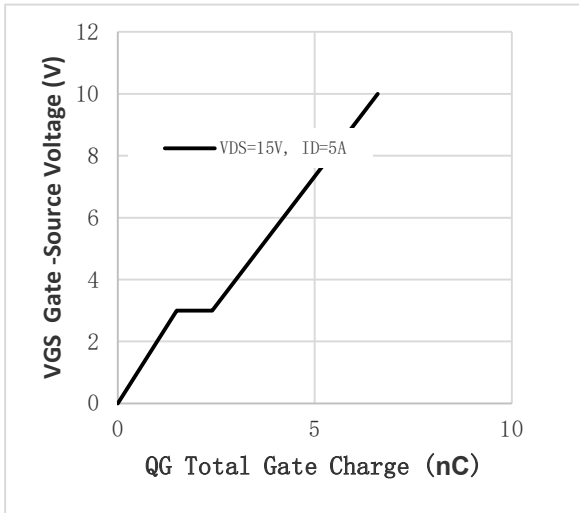


Fig.2 Capacitance Characteristics

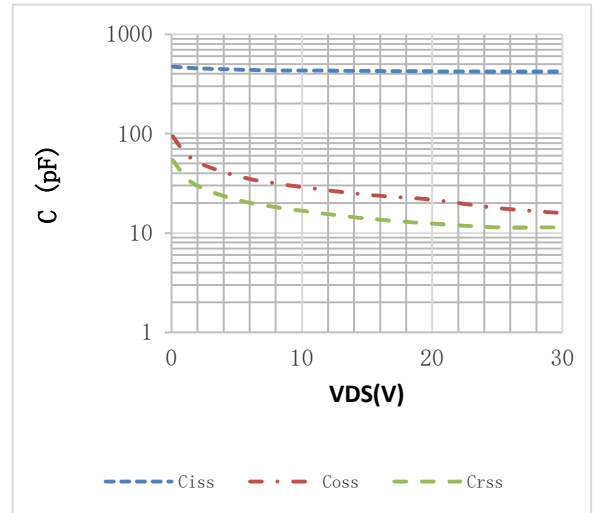


Fig.3 Power Dissipation

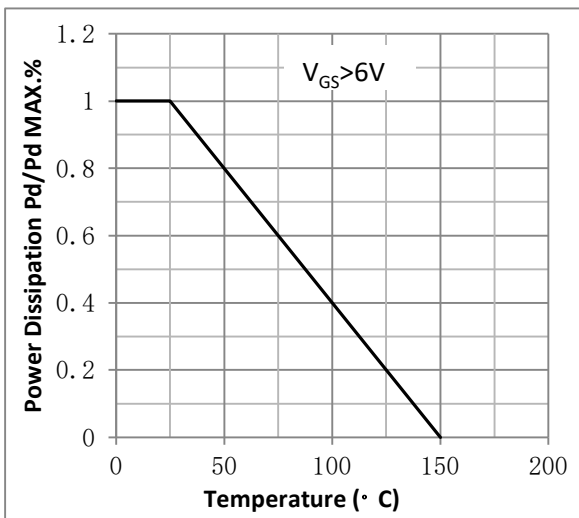


Fig.4 Typical output Characteristics

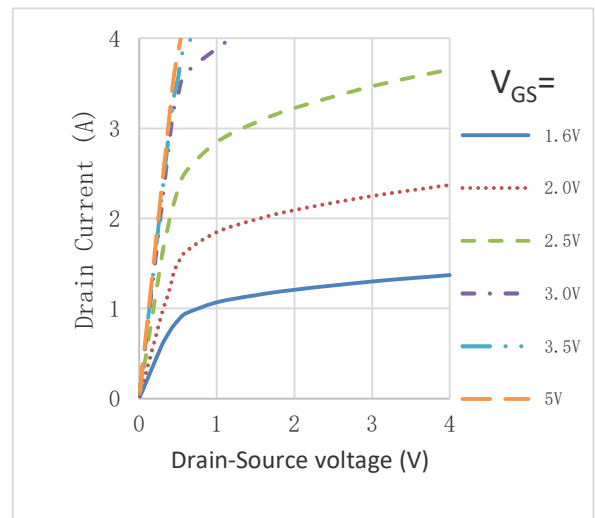


Fig.5 Threshold Voltage V.S Junction Temperature

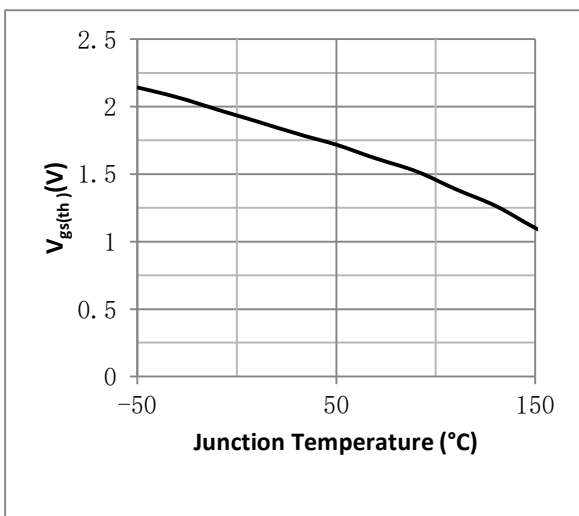


Fig.6 Resistance V.S Drain Current

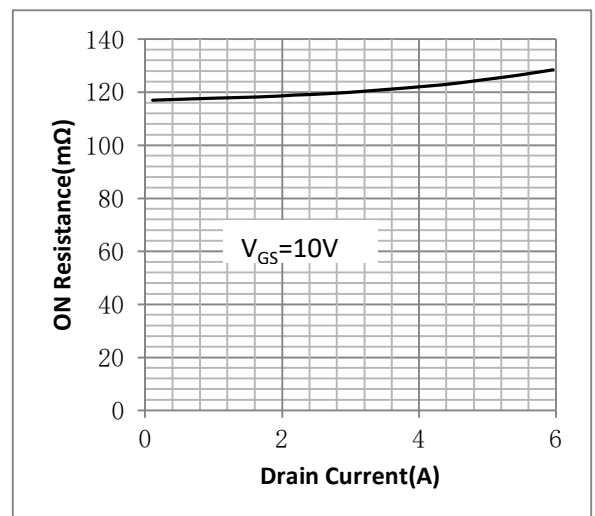


Fig.7 On-Resistance VS Gate Source Voltage

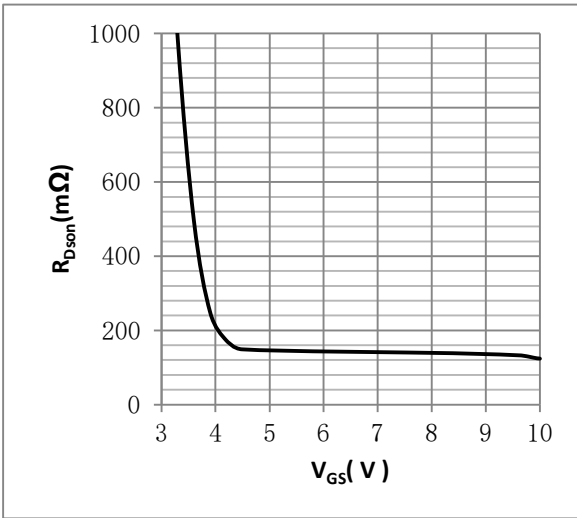


Fig.8 On-Resistance V.S Junction Temperature

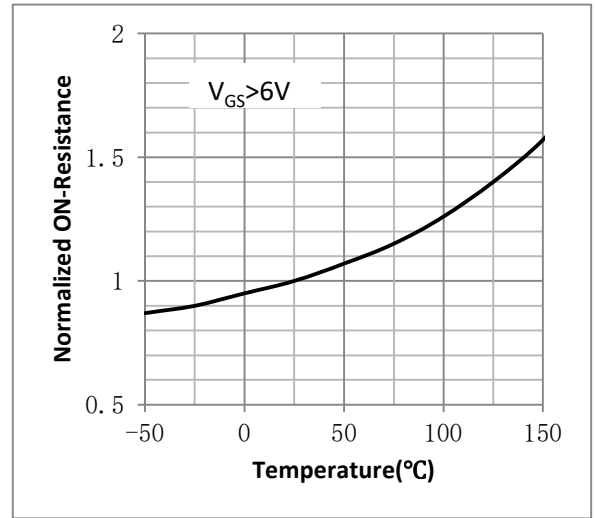


Figure 9. Diode Forward Voltage vs. Current

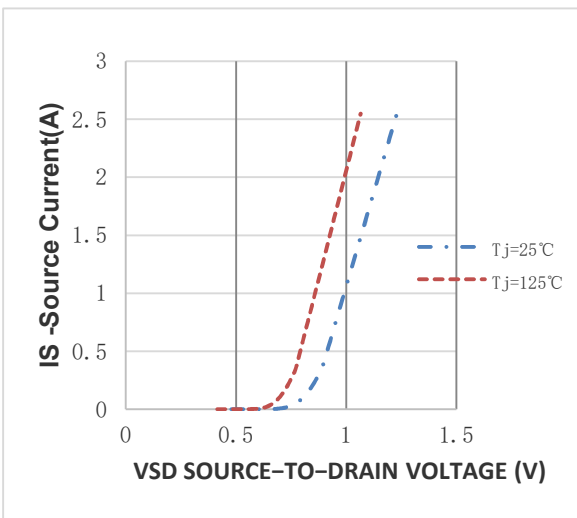


Figure 10. Transfer Characteristics

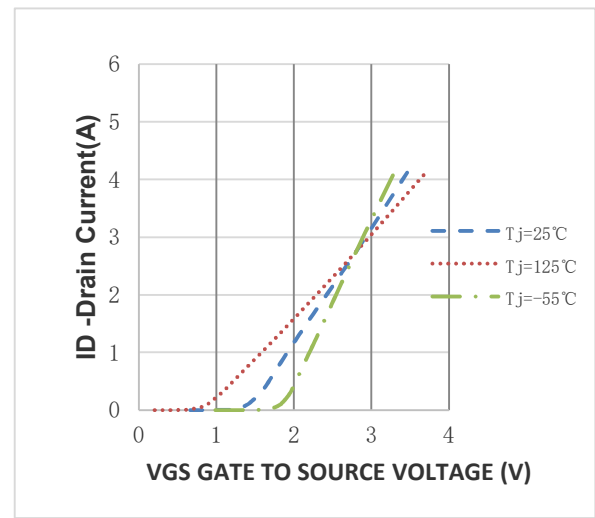


Fig.11 Safe Operating Area

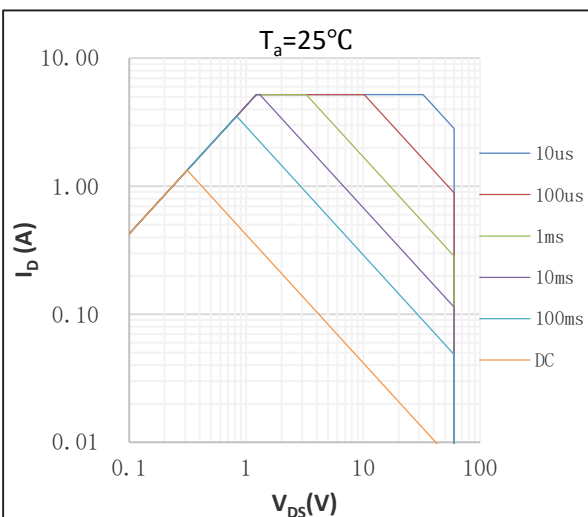
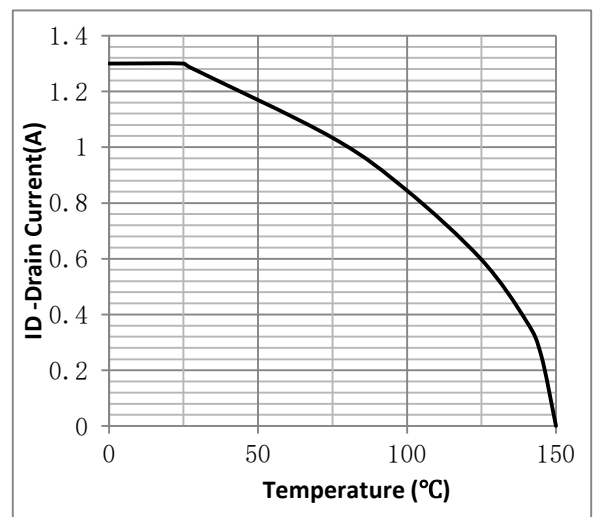
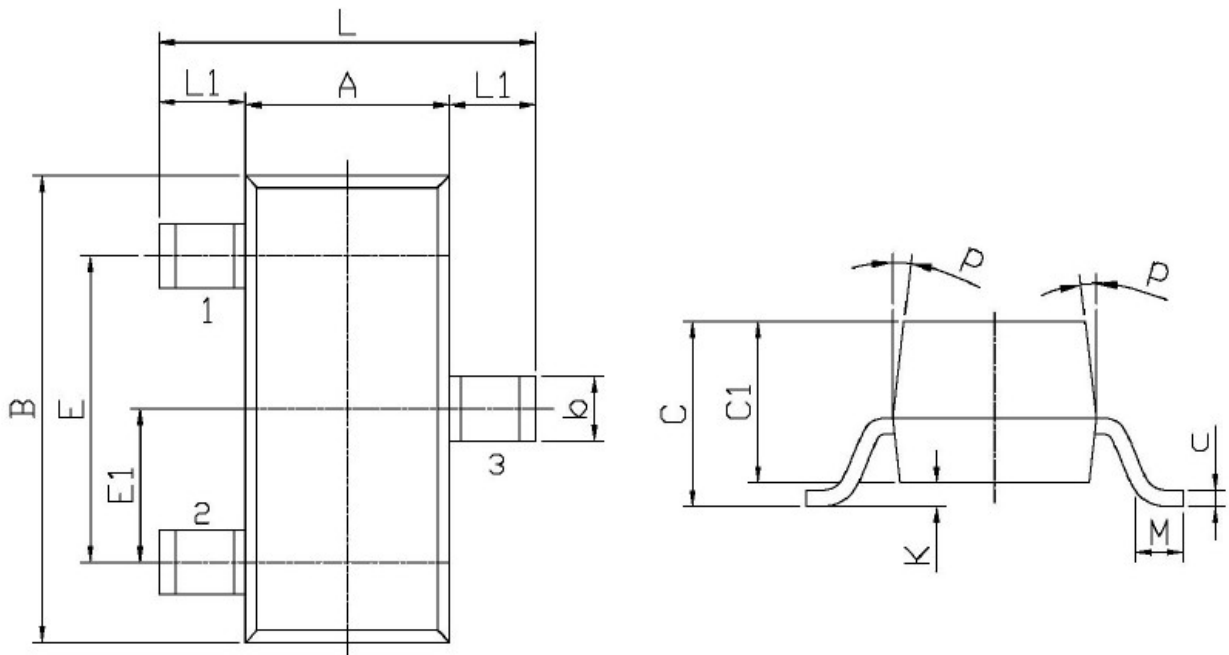


Fig.12 I_D vs. Case Temperature^②



•SOT-23(TO-236) Package Outline



Symbol	Dimensions In Millimeters		Symbol	Dimensions In Millimeters	
	Min	Max		Min	Max
L	2.2	2.7	C	1.30Max	
L1	0.45	0.65	C1	0.90	1.20
A	1.15	1.50	c	0.05	0.20
B	2.70	3.10	K	0	0.10
E	1.70	2.10	M	0.20MIN	
E1	0.85	1.05	P	7°	
b	0.35	0.55			

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	2024.12.28	New