

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
- Load switch

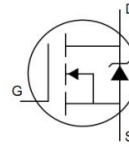
• Ordering Information:

Part NO.	ZMA300N06E
Marking	300N06
Packing Information	REEL TAPE
Basic ordering unit (pcs)	3000

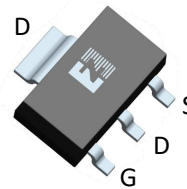
• Absolute Maximum Ratings ($T_C=25^\circ\text{C}$)

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DS}		60	V
Gate-Source Voltage	V_{GS}		± 20	V
Continuous Drain Current	I_D	$T_C=25^\circ\text{C}$	12	A
	I_D	$T_C=75^\circ\text{C}$	10	A
	I_D	$T_C=100^\circ\text{C}$	8	A
Pulsed Drain Current	I_{DM}	Pulsed; $t_p \leq 10 \mu\text{s}$; $T_{mb} = 25^\circ\text{C}$;	48	A
Total Power Dissipation	P_D	$T_C=25^\circ\text{C}$	13	W
Total Power Dissipation	P_D	$T_A=25^\circ\text{C}$	1.3	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}	$L=0.1\text{mH}$, $V_{GS}=10\text{V}$, $R_g=25\Omega$,	20	mJ
		$L=0.5\text{mH}$, $V_{GS}=10\text{V}$, $R_g=25\Omega$,	42	mJ
ESD Level (HBM)	CLASS 1C			

• Product Summary



$V_{DS} = 60\text{V}$
 $R_{DS(ON)} = 28\text{m}\Omega$
 $I_D = 12\text{A}$



SOT-223



•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}		-	10	$^{\circ}C/W$
Thermal resistance, junction-ambient ^①	R_{thJA}		-	100	$^{\circ}C/W$
Soldering temperature	T_{sold}		-	260	$^{\circ}C$

•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	1.7	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	$R_{DS(ON)}$	$V_{GS}=10V, I_D=5A$		28	36	$m\Omega$
		$V_{GS}=4.5V, I_D=3A$		33	43	$m\Omega$
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_{SD}=10A$		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}	$f=1MHz, V_{DS}=25V$	-	1300	-	pF	
Output capacitance	C_{oss}		-	53	-		
Reverse transfer capacitance	C_{rss}		-	31	-		
Gate Resistance	R_g	$f=1MHz$	-	1		Ω	
Total gate charge	Q_g	$V_{DD}=15V, I_D=20A, V_{GS}=10V$	-	18	-	nC	
	$Q_g(4.5v)$		-	9	-		
	Gate - Source charge		Q_{gs}	-	4		-
	Gate - Drain charge		Q_{gd}	-	2.5		-
Turn-ON Delay time	$t_{D(on)}$	$V_{GS}=10V, V_{DS}=15V, R_G=3.3\Omega, I_D=20A$	-	11	-	ns	
Turn-ON Rise time	t_r		-	16	-	ns	
Turn-Off Delay time	$t_{D(off)}$		-	43	-	ns	
Turn-Off Fall time	t_f		-	30	-	ns	
Reverse Recovery Time	t_{RR}	$V_{DD}=20V, di_S/dt=100A/\mu s, I_S=20A$	-	46	-	ns	
Reverse Recovery Charge	Q_{RR}		-	53	-	nC	

Fig.1 Gate-Charge Characteristics

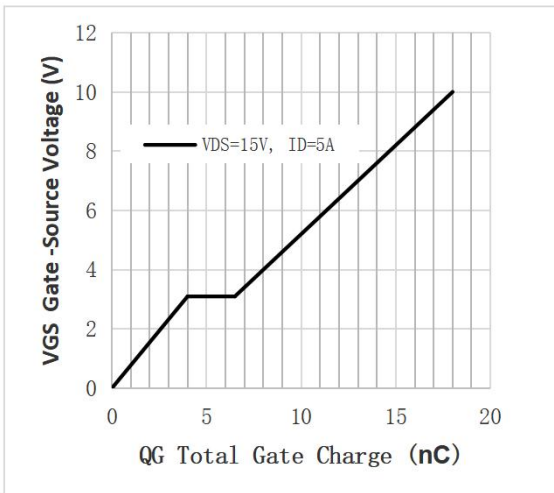


Fig.2 Capacitance Characteristics

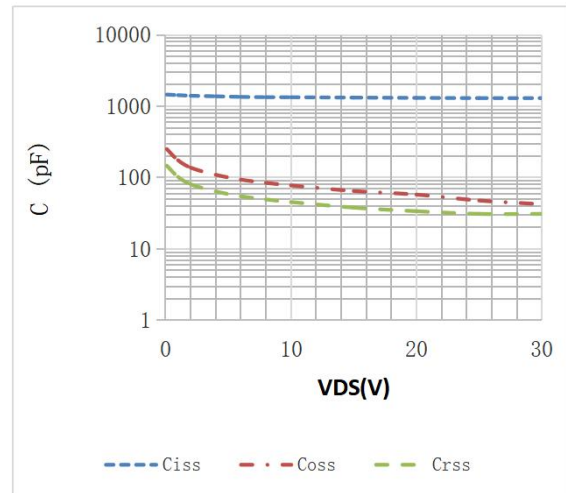


Fig.3 Power Dissipation

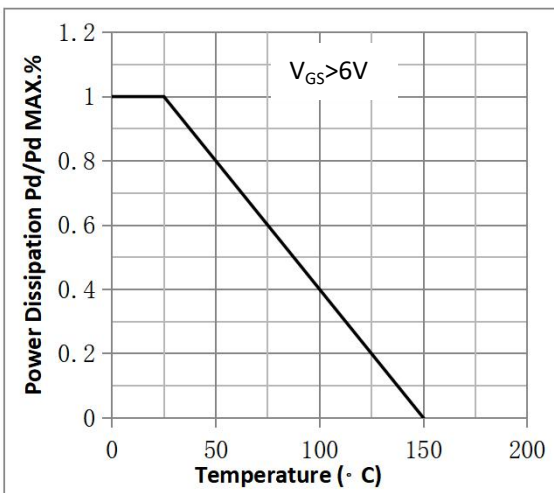


Fig.4 Typical output Characteristics

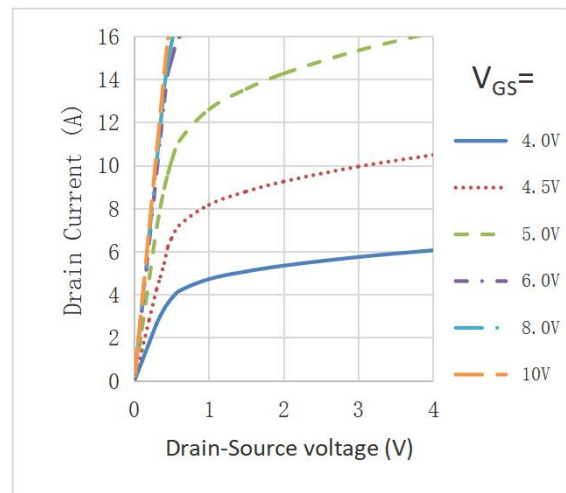


Fig.5 Threshold Voltage V.S Junction Temperature

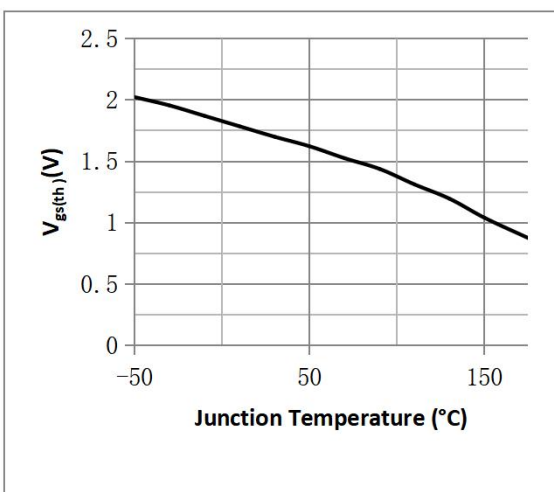


Fig.6 Resistance V.S Drain Current

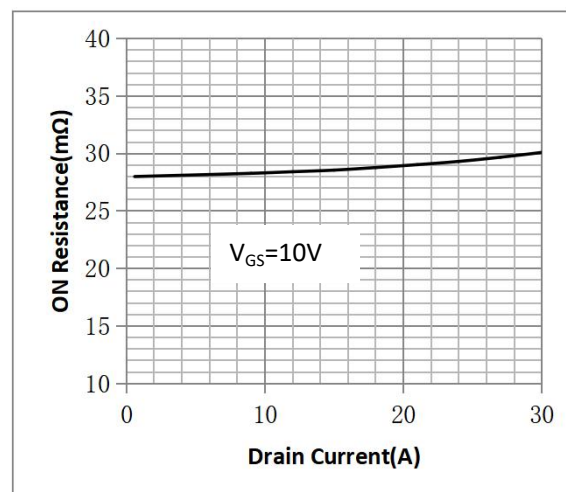


Fig.7 On-Resistance VS Gate Source Voltage

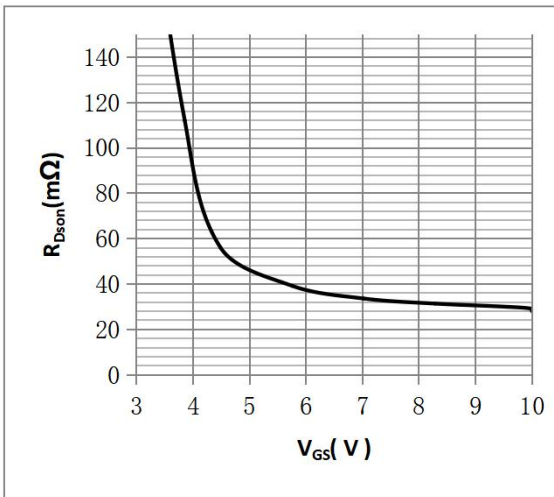


Fig.8 On-Resistance V.S Junction Temperature

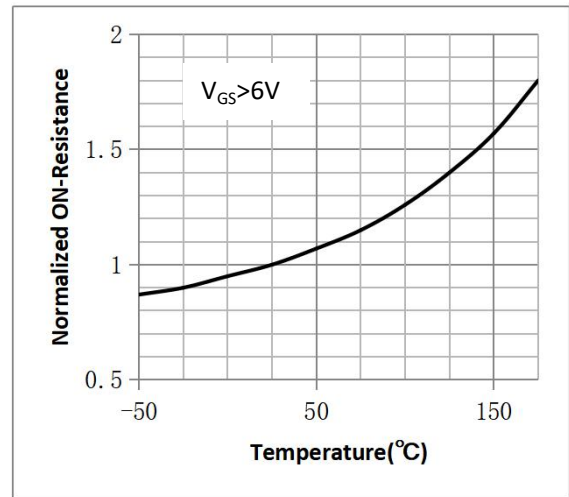


Figure 9. Diode Forward Voltage vs. Current

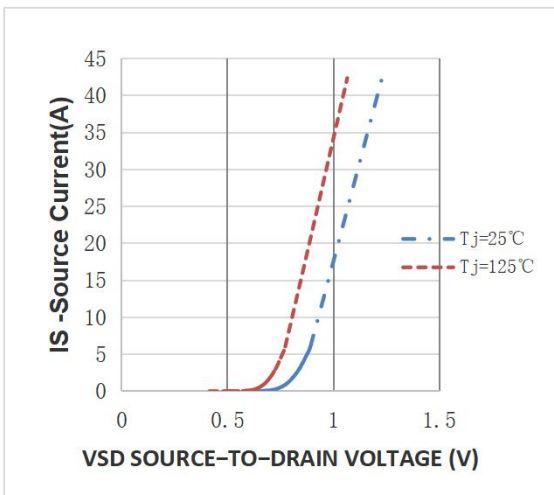


Figure 10. Transfer Characteristics

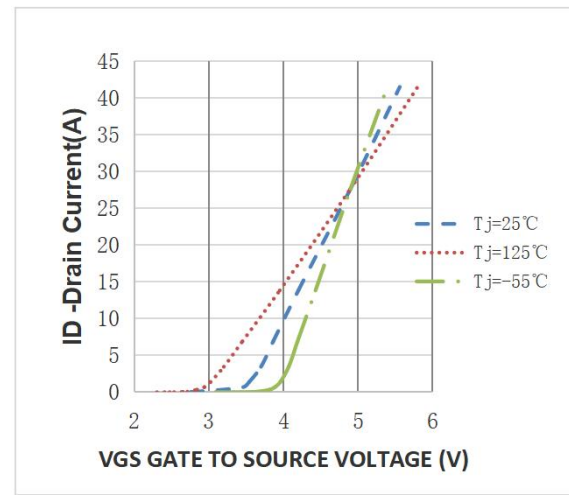


Fig.11 Safe Operating Area

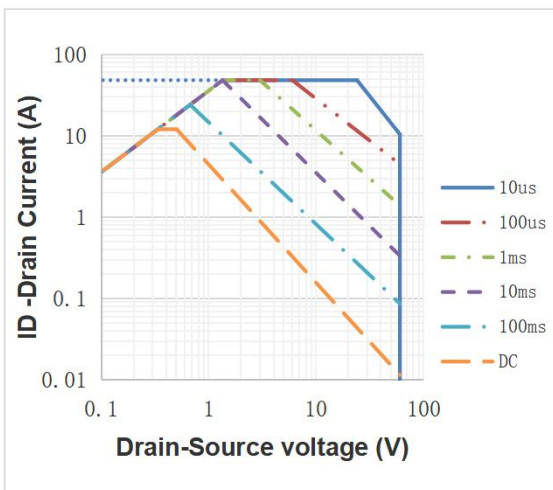
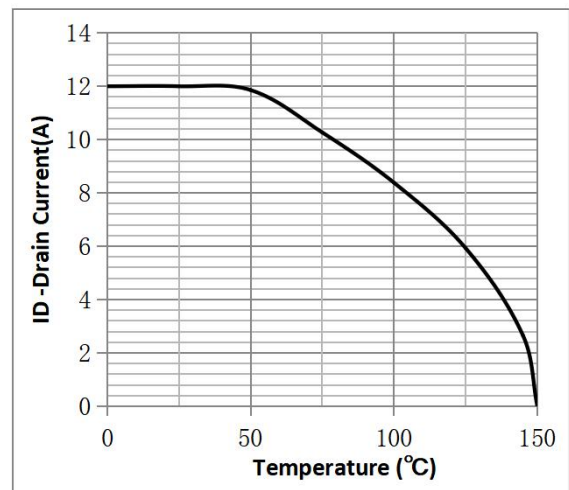
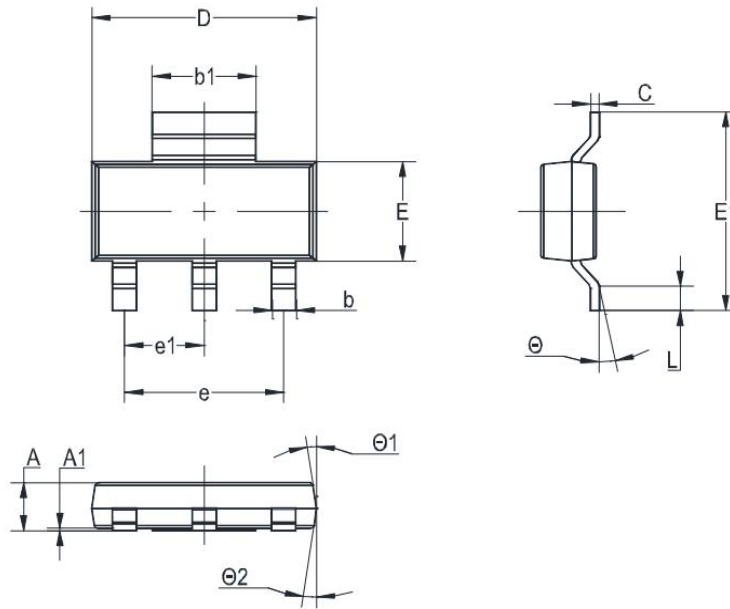


Fig.12 ID vs. Case Temperature^②

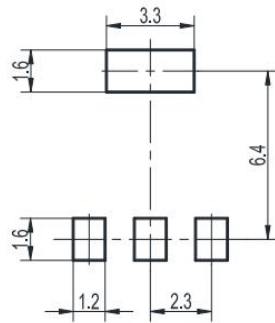


●SOT-223 Package Outline



Unit	A	A1	b	b1	C	D	E	E1	e	e1	L	Θ	Θ1	Θ2
mm	1.8	0.1	0.8	3.1	0.32	6.7	3.7	7.3	4.6	2.3	1.1	10°	7°	7°
	1.5	MAX	0.6	2.9	0.22	6.3	3.3	6.7	TYP	TYP	0.7	0°	0°	0°

Recommended Soldering Footprint



Packing information

Package	Tape Width (mm)	Pitch		Reel Size		Per Reel Packing Quantity
		mm	inch	mm	inch	
SOT-223	12	8 ± 0.1	0.315 ± 0.004	330	13	3,000

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	2021.12.5	NEW
B	2022.9.10	1.Add Reach, HF figure, 2.ID modify
C	2022.12.10	ID Curve modify