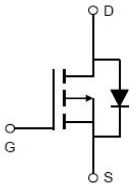
-40V P-Channel Power MOSFET

• General Description

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

• Product Summary



V_{DS}= -40V

$R_{DS(ON)}$ = 49mΩ

I_D= -3.4A

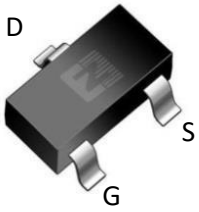
• Features

■AEC-Q101 Qualified

■Low $R_{DS(ON)}$ to minimize conductive loss

■High GOX reliability

■Low Thermal resistance



SOT-23-3

•Application

■BLDC Motor driver

■DC-DC

■Load Switch

•Ordering Information:

Part NO.	ZMA390P04T
Marking	390P04
Packing Information	REEL TAPE
Basic ordering unit (pcs)	3000

•Absolute Maximum Ratings (T_C=25℃)

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DS}		-40	V
Gate-Source Voltage	V_{GS}		±20	V
Continuous Drain Current	I_D	T_C=25℃	-3.4	A
	I_D	T_C=75℃	-2.6	A
	I_D	T_C=100℃	-2.2	A
Pulsed Drain Current	I_{DM}	Pulsed; t_p ≤ 10 μs; T_{mb} = 25 °C;	-13.6	A
Total Power Dissipation	P_D	T_C=25℃	2	W
Total Power Dissipation	P_D	T_A=25℃	0.7	W
Operating Junction Temperature	T_J		-55 to +150	℃
Storage Temperature	T_{STG}		-55 to +150	℃
Single Pulse Avalanche Energy	E_{AS}	L=0.1mH, V_{GS}=-10V, Rg=25Ω,	5	mJ
		L=0.5mH, V_{GS}=-10V, Rg=25Ω,	9	mJ
ESD Level (HBM)	CLASS 2			

●Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}		-	80	°C/W
Thermal resistance, junction-ambient①	R_{thJA}		-	180	°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	-40			V
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} =V_{DS}, I_D = -250uA	-1.3	-1.8	-2.5	V
Drain-Source Leakage Current	I_{DSS}	V_{GS}=0V, V_{DS}= -40V			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= -3.4A		49	70	mΩ
		V_{GS}=-4.5V, I_D= -3A		71	100	mΩ
Forward Transconductance	g_{FS}	V_{DS} =-5V, I_{SD} = -1A		3		s
Diode Forward Voltage	V_{FSD}	V_{GS} =0V, I_{SD} = -3.4A			1.3	V

●Dynamic characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	Ciss	f = 1MHz, V_{DS}=-25V	-	838	-	pF
Output capacitance	Coss		-	94	-	
Reverse transfer capacitance	Crss		-	70	-	
Gate Risistance	Rg	f = 1MHz	-	9		Ω
Total gate charge	Qg	V_{DD} = -15V, I_D = -1A, V_{GS} = -10V	-	15	-	nC
	Qg(-4.5v)		-	7.3	-	
Gate - Source charge	Qgs		-	2.3	-	
Gate - Drain charge	Qgd		-	3.6	-	
Turn-ON Delay time	$t_{D(on)}$	V_{GS}=-10V,V_{DS}=-15V, R_G =3.3Ω, I_D =-1A	-	9	-	ns
Turn-ON Rise time	t_r		-	12	-	ns
Turn-Off Delay time	$t_{D(off)}$		-	19	-	ns
Turn-Off Fall time	t_f		-	6	-	ns

Fig.1 Gate-Charge Characteristics

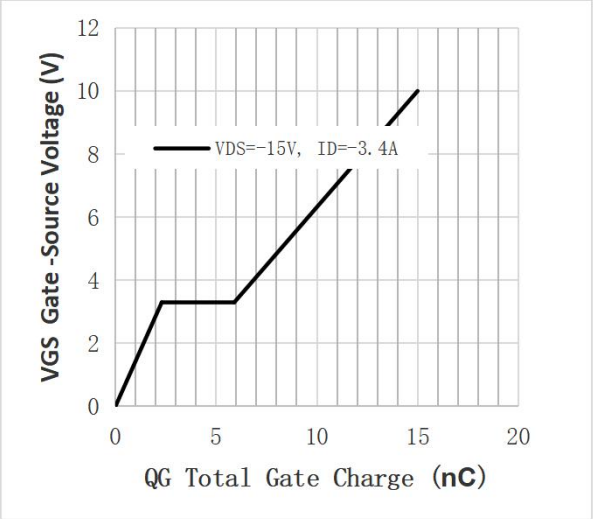


Fig.2 Capacitance Characteristics

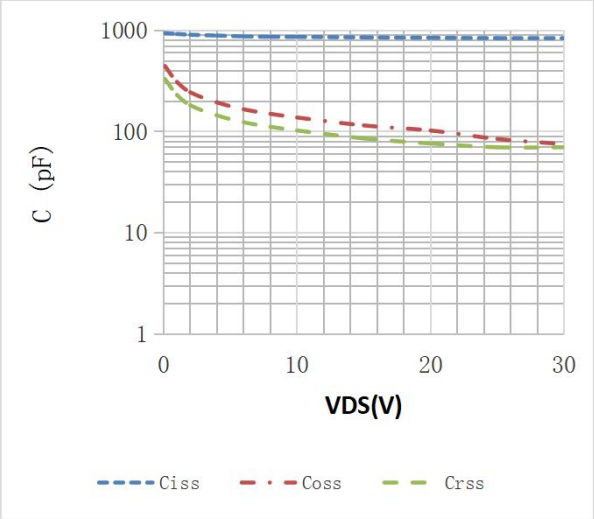


Fig.3 Power Dissipation

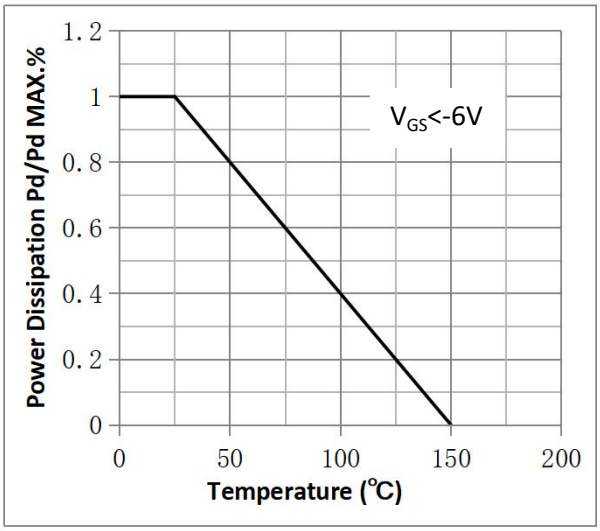


Fig.4 Typical output Characteristics

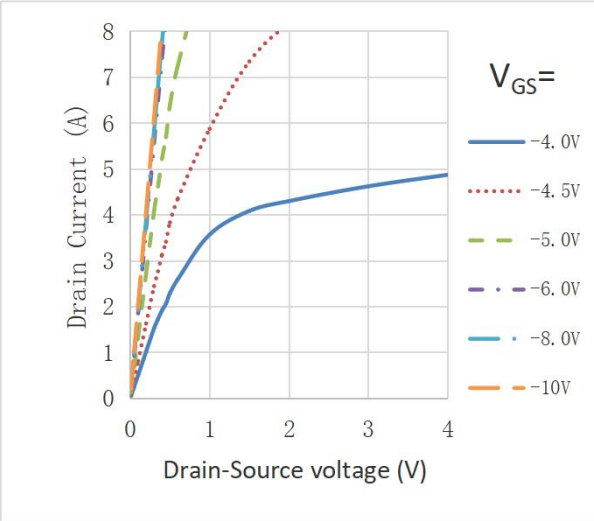


Fig.5 Threshold Voltage V.S Junction Temperature

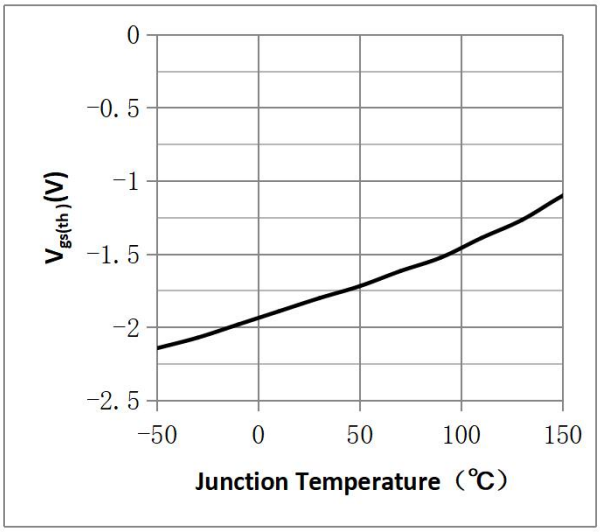


Fig.6 Resistance V.S Drain Current

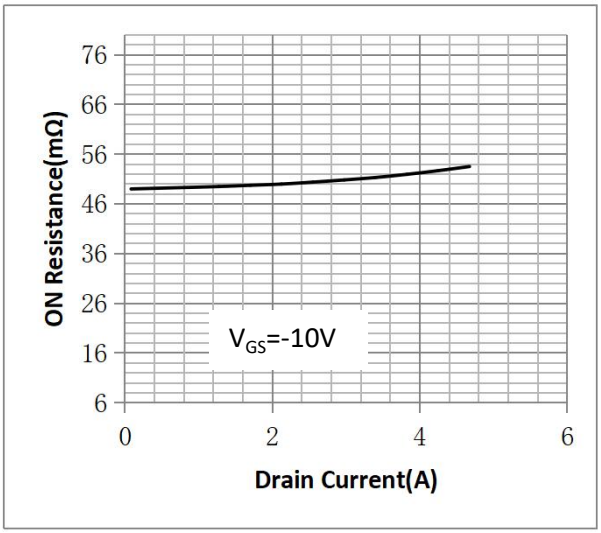


Fig.7 On-Resistance VS Gate Source Voltage

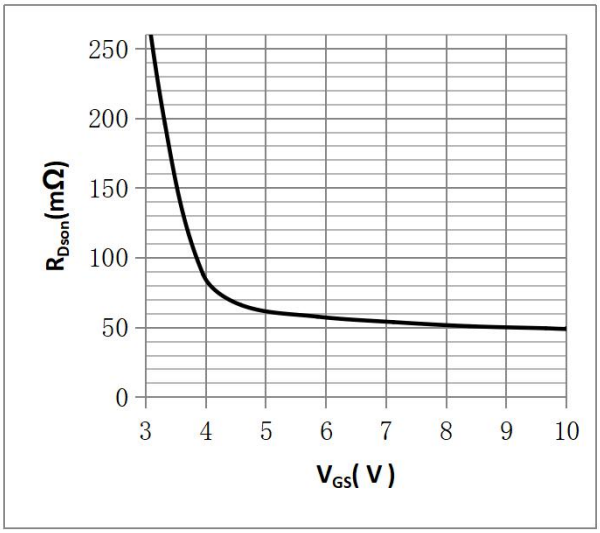


Fig.8 On-Resistance V.S Junction Temperature

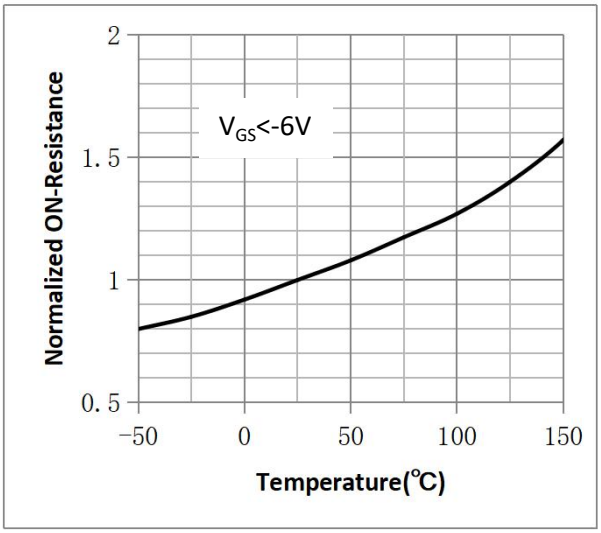


Figure 9. Diode Forward Voltage vs. Current

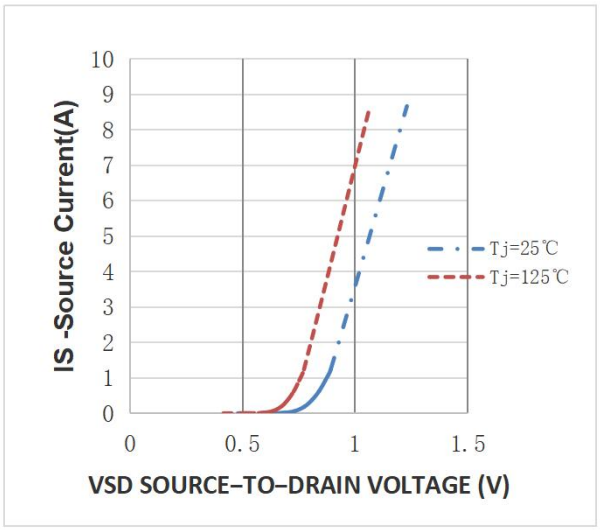


Figure 10. Transfer Characteristics

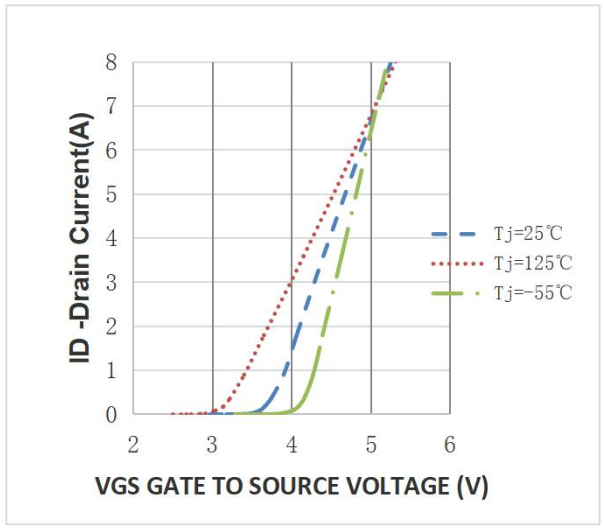


Fig.11 Safe Operating Area

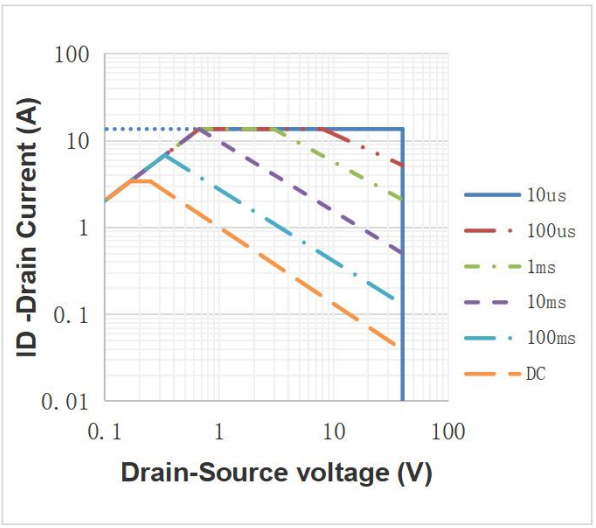
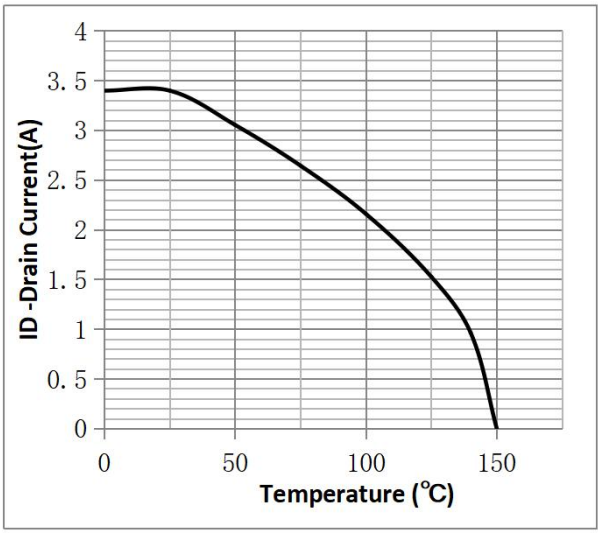
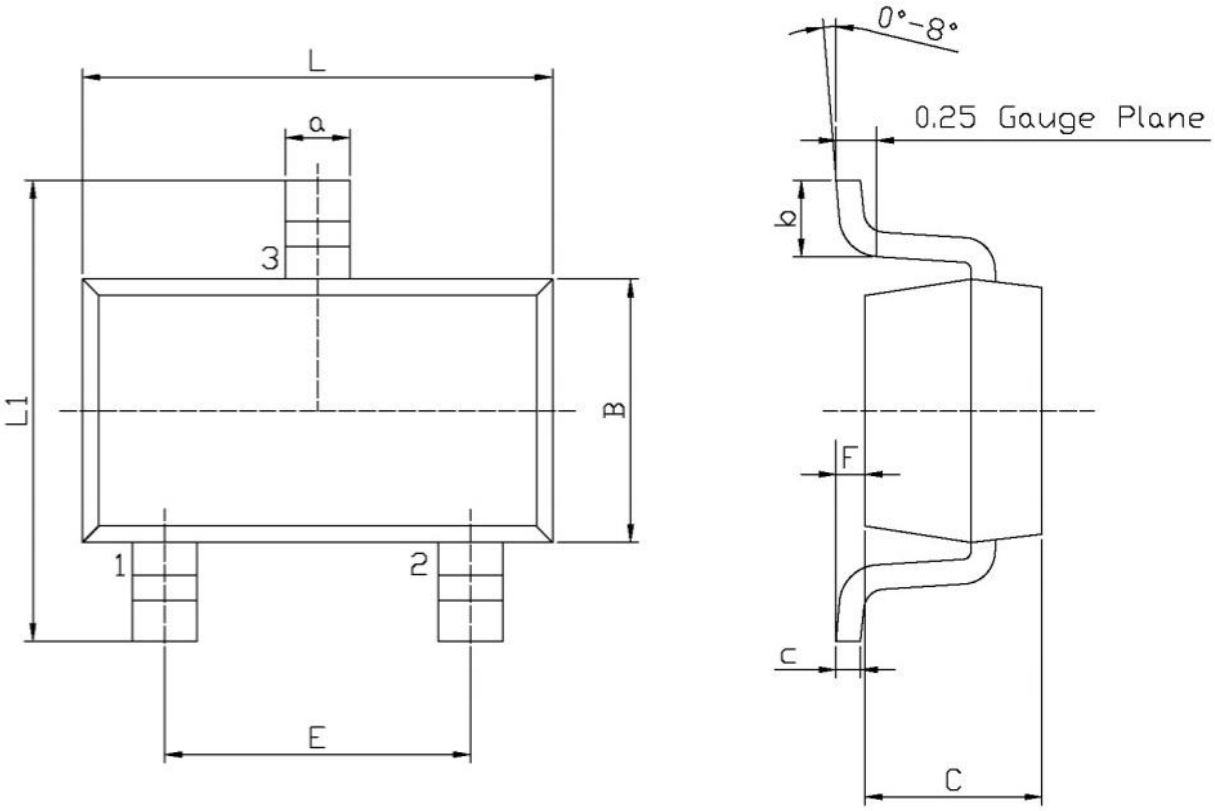


Fig.12 ID vs. Case Temperature②



●SOT-23-3 Package Outline



Unit: mm

Symbol	Dimensions In Millimeters		Symbol	Dimensions In Millimeters	
	Min	Max		Min	Max
L	2.82	3.02	a	0.35	0.50
B	1.50	1.70	c	0.10	0.20
C	0.90	1.30	b	0.35	0.55
L1	2.60	3.00	F	0	0.15
E	1.80	2.00			

Note:

① Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate；

②Practically the current will be limited by PCB, thermal design and operating temperature. VGS=-10V.

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Revision History

Version	Date	Change
A	2021.12.3	NEW
B	2022.9.7	characteristics 3.ID and ID curve modified