

-30V P-Channel Power MOSFET

• General Description

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

• Features

- Low  $R_{DS(ON)}$  to minimize conductive loss
- High GOX reliability
- Low Thermal resistance

• Application

- BLDC Motor driver
- DC-DC
- Load switch

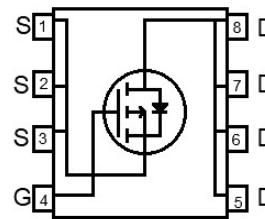
• Ordering Information:

Part NO.	ZM035P03N
Marking	ZM035P03
Packing Information	REEL TAPE
Basic ordering unit (pcs)	3000

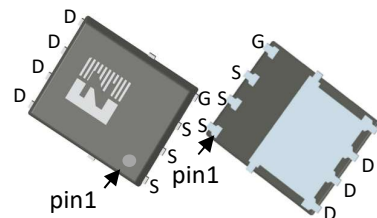
• Absolute Maximum Ratings ( $T_C=25^\circ\text{C}$ )

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	$V_{DS}$		-30	V
Gate-Source Voltage	$V_{GS}$		$\pm 20$	V
Continuous Drain Current	$I_D$	$T_C=25^\circ\text{C}$	-90	A
	$I_D$	$T_C=75^\circ\text{C}$	-87	A
	$I_D$	$T_C=100^\circ\text{C}$	-71	A
Pulsed Drain Current	$I_{DM}$	Pulsed; $t_p \leq 10 \mu\text{s}$ ; $T_{mb} = 25^\circ\text{C}$ ;	-360	A
Total Power Dissipation	$P_D$	$T_C=25^\circ\text{C}$	89	W
Total Power Dissipation	$P_D$	$T_A=25^\circ\text{C}$	3.4	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	$E_{AS}$	$L=0.1\text{mH}$ , $V_{GS}=-10\text{V}$ , $R_g=25\Omega$ ,	180	mJ
		$L=0.5\text{mH}$ , $V_{GS}=-10\text{V}$ , $R_g=25\Omega$ ,	378	mJ
ESD Level (HBM)			CLASS 2	

• Product Summary



$V_{DS} = -30\text{V}$   
 $R_{DS(ON)} = 3.5\text{m}\Omega$   
 $I_D = -90\text{A}$



DFN5\*6



**•Thermal resistance**

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	$R_{thJC}$		-	1.4	°C/W
Thermal resistance, junction-ambient①	$R_{thJA}$		-	37	°C/W
Soldering temperature	$T_{sold}$		-	260	°C

**•Electronic Characteristics**

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0V, I_D = -250\mu A$	-30			V
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = -250\mu A$	-1.2	-1.8	-2.5	V
Drain-Source Leakage Current	$I_{DSS}$	$V_{GS} = 0V, V_{DS} = -30V$			1.0	$\mu A$
Gate- Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS} = 0V$			100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	$V_{GS} = -10V, I_D = -24A$		3.5	4.5	m $\Omega$
		$V_{GS} = -4.5V, I_D = -12A$		6	7.2	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS} = -5V, I_{SD} = -24A$		20		S
Diode Forward Voltage	$V_{FSD}$	$V_{GS} = 0V, I_{SD} = -24A$			1.3	V

**•Dynamic characteristics**

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	
Input capacitance	$C_{iss}$	$f = 1MHz, V_{DS} = -25V$	-	6670	-	pF	
Output capacitance	$C_{oss}$		-	664	-		
Reverse transfer capacitance	$C_{rss}$		-	542	-		
Gate Resistance	$R_g$	$f = 1MHz$	-	3		$\Omega$	
Total gate charge	$Q_g$	$V_{DD} = -15V, I_D = -10A, V_{GS} = -10V$	-	113	-	nC	
	$Q_g(-4.5V)$		-	61	-		
	Gate - Source charge		$Q_{gs}$	-	22		-
	Gate - Drain charge		$Q_{gd}$	-	14		-
Turn-ON Delay time	$t_{D(on)}$	$V_{GS} = -10V, V_{DS} = -15V, R_G = 3.3\Omega, I_D = -10A$	-	27	-	ns	
Turn-ON Rise time	$t_r$		-	110	-	ns	
Turn-Off Delay time	$t_{D(off)}$		-	100	-	ns	
Turn-Off Fall time	$t_f$		-	42	-	ns	
Reverse Recovery Time	$t_{RR}$	$V_{DD} = -20V, dI_S/dt = 100A/\mu s, I_S = -20A$	-	205	-	ns	
Reverse Recovery Charge	$Q_{RR}$		-	467	-	nC	

Fig.1 Gate-Charge Characteristics

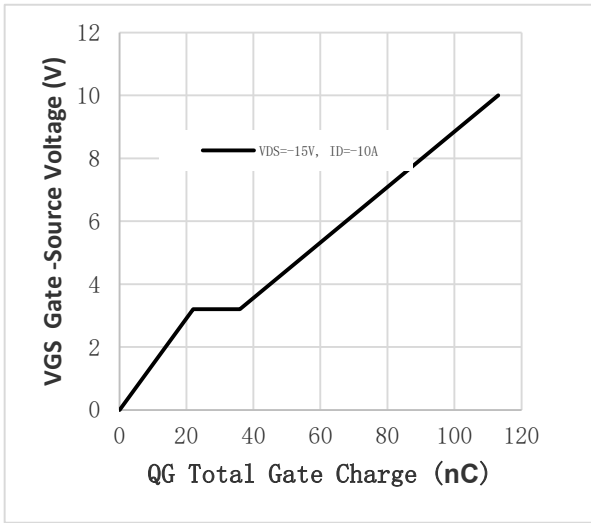


Fig.2 Capacitance Characteristics

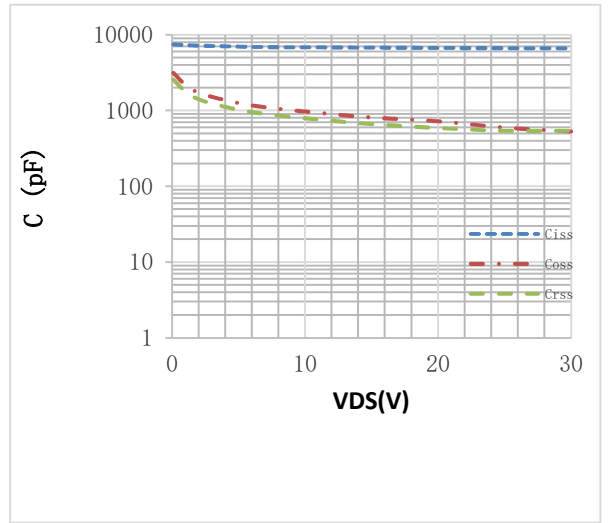


Fig.3 Power Dissipation

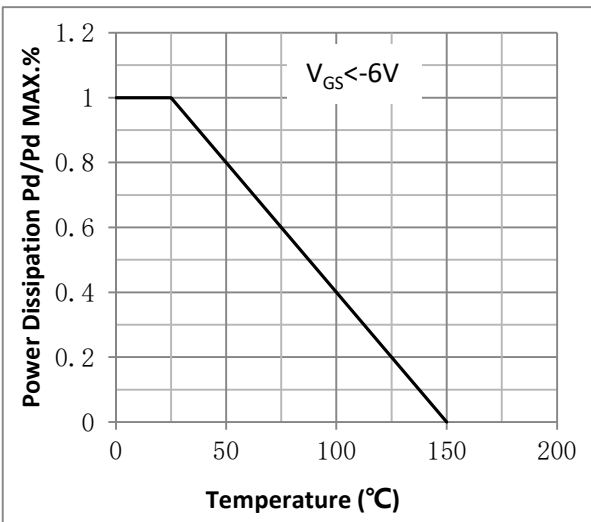


Fig.4 Typical output Characteristics

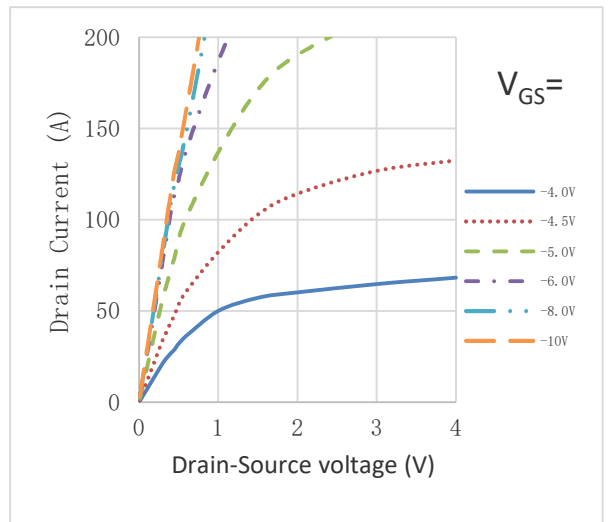


Fig.5 Threshold Voltage V.S Junction Temperature

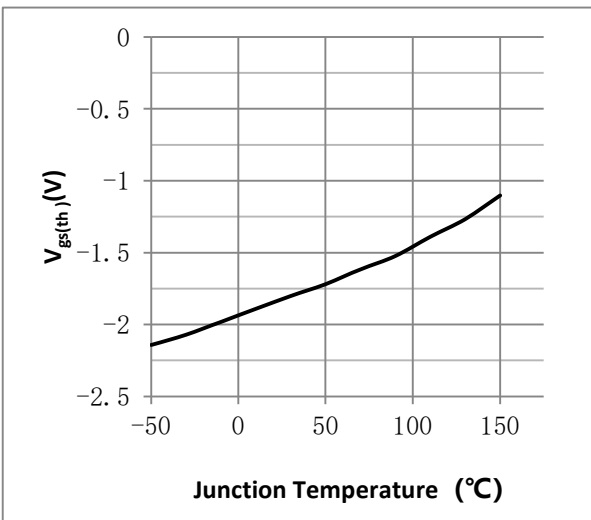


Fig.6 Resistance V.S Drain Current

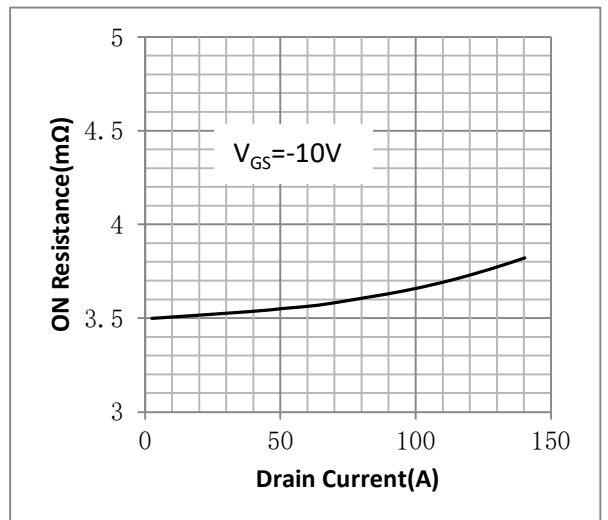


Fig.7 On-Resistance VS Gate Source Voltage

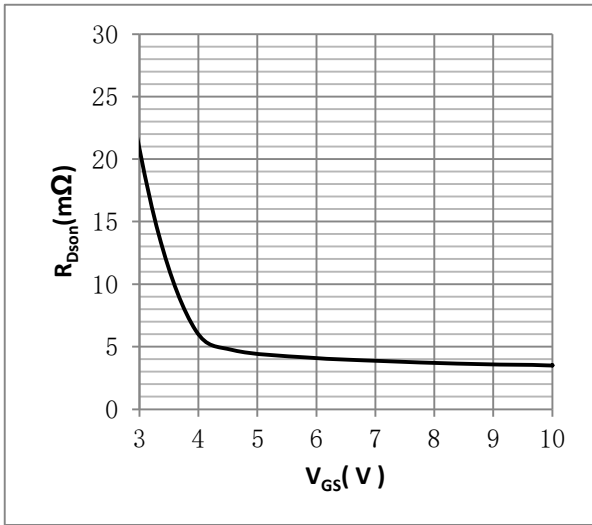


Fig.8 On-Resistance V.S Junction Temperature

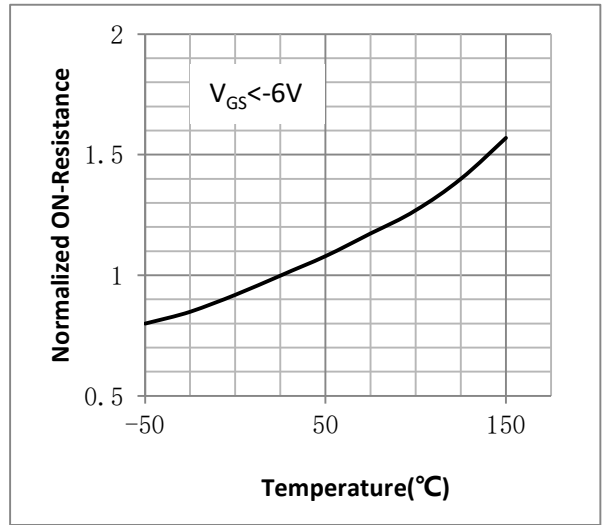


Figure 9. Diode Forward Voltage vs. Current

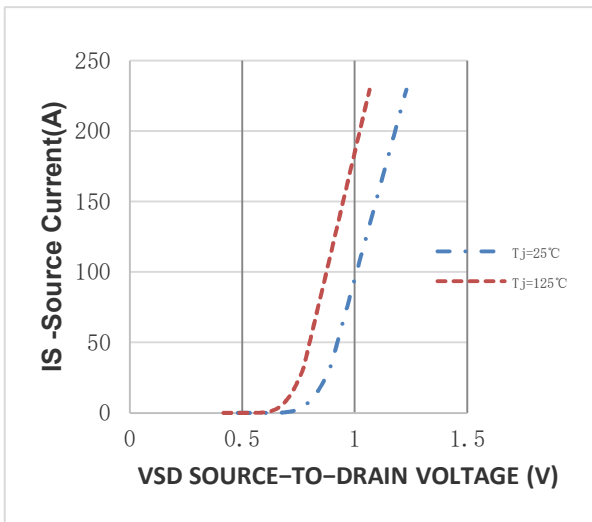


Figure 10. Transfer Characteristics

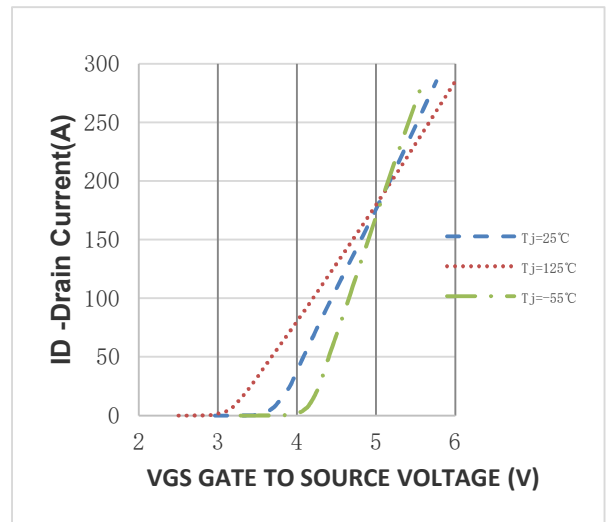


Fig.11 Safe Operating Area

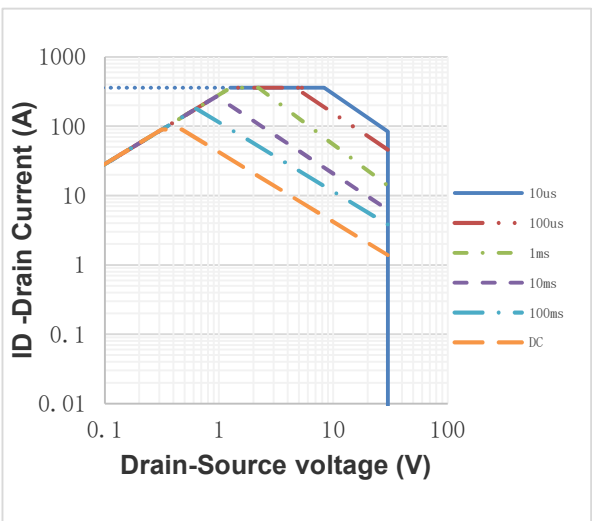
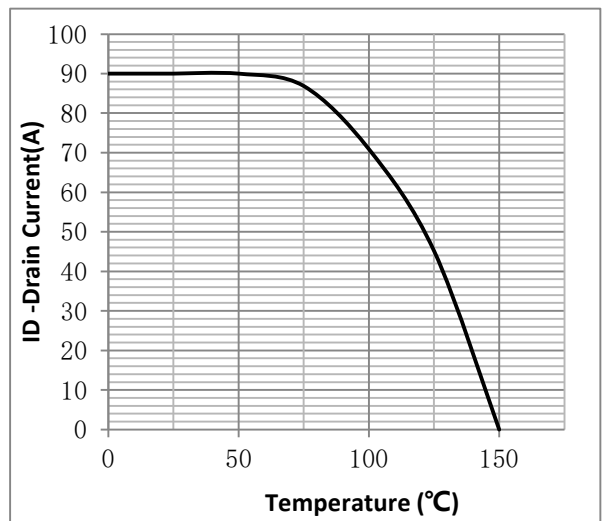
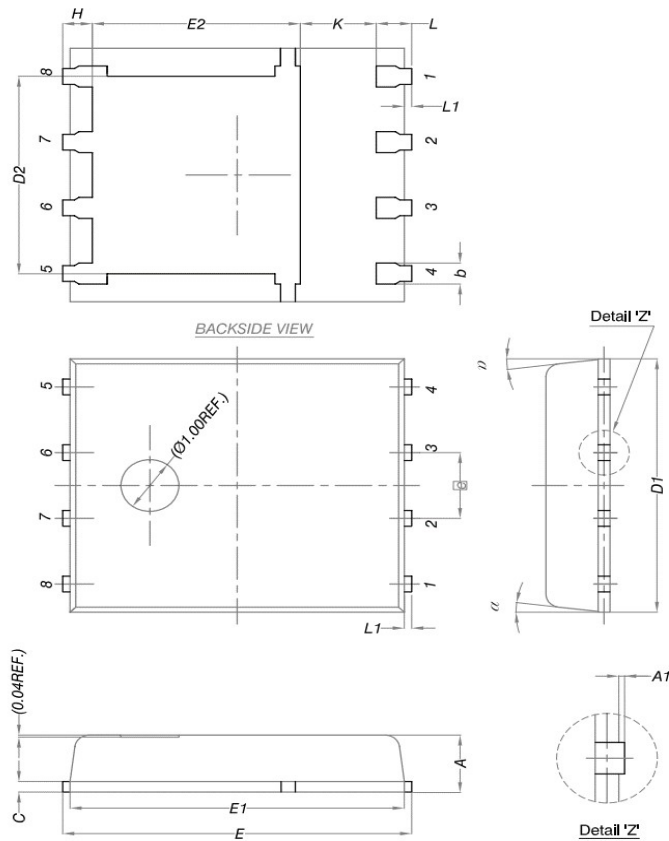


Fig.12 ID vs. Case Temperature<sup>Ⓢ</sup>



•DFN5\*6 Package Outline



DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0	-	0.05
b	0.33	0.41	0.51
C	0.20	0.25	0.30
D1	4.80	4.90	5.00
D2	3.61	3.81	3.96
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.38	3.58	3.78
<span style="border: 1px solid black; padding: 2px;">e</span>	1.27 BSC		
H	0.41	0.51	0.61
K	1.10	-	-
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
$\alpha$	0°	-	12°

**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	2021.10.3	NEW
B	2024.1.20	Correct characteristic curves. Add dynamic characteristics
C	2024.5.13	Correct Qg chart VDS voltage.