

-40V P-Channel Power MOSFET

● **General Description**

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

● **Features**

- 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

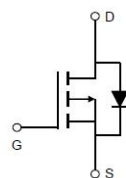
● **Ordering Information:**

Part NO.	ZM025P04HB
Marking	ZM025P04
Packing Information	REEL TAPE
Basic ordering unit (pcs)	800

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

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DS}		-40	V
Gate-Source Voltage	V_{GS}		± 20	V
Continuous Drain Current	I_D	$T_C=25^{\circ}\text{C}$	-170	A
	I_D	$T_C=75^{\circ}\text{C}$	-139	A
	I_D	$T_C=100^{\circ}\text{C}$	-113	A
Pulsed Drain Current	I_{DM}	Pulsed; $t_p \leq 10 \mu\text{s}$; $T_{mb} = 25^{\circ}\text{C}$;	-680	A
Total Power Dissipation	P_D	$T_C=25^{\circ}\text{C}$	208	W
Total Power Dissipation	P_D	$T_A=25^{\circ}\text{C}$	4.2	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}	$L=0.1\text{mH}$, $V_{GS}=10\text{V}$, $R_g=25\Omega$,	1060	mJ
		$L=0.5\text{mH}$, $V_{GS}=10\text{V}$, $R_g=25\Omega$,	1802	mJ
ESD Level (HBM)	CLASS 2			

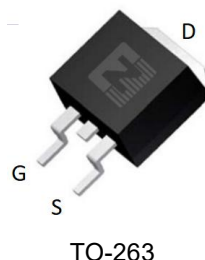
● **Product Summary**



$$V_{DS} = -40\text{V}$$

$$R_{DS(ON)} = 2.5\text{m}\Omega$$

$$I_D = -170\text{A}$$



•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}		-	0.6	°C/W
Thermal resistance, junction-ambient ^①	R_{thJA}		-	30	°C/W
Soldering temperature	Tsold		-	260	°C

•Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-40			V
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=-250\mu A$	-2	-2.7	-4	V
Drain-Source Leakage Current	I_{DSS}	$V_{GS}=0V, V_{DS}=-40V$			1.0	μA
Gate- Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$			100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-15A$		2.5	3.1	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=-5V, I_{SD}=-10A$		20		S
Diode Forward Voltage	V_{FSD}	$V_{GS}=0V, I_{SD}=-15A$			1.3	V

•Dynamic characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	C_{iss}	$f=1MHz, V_{DS}=-25V$	-	15100	-	pF
Output capacitance	C_{oss}		-	1670	-	
Reverse transfer capacitance	C_{rss}		-	780	-	
Gate Resistance	R_g	$f=1MHz$	-	5.5		Ω
Total gate charge	Q_g	$V_{DD}=-15V,$ $I_D=-10A,$ $V_{GS}=-10V$	-	220	-	nC
Gate - Source charge	Q_{gs}		-	44	-	
Gate - Drain charge	Q_{gd}		-	40	-	
Turn-ON Delay time	$t_{D(on)}$	$V_{GS}=-10V, V_{DS}=-15V,$ $R_G=3.3\Omega, I_D=-10A$	-	21	-	ns
Turn-ON Rise time	t_r		-	16	-	ns
Turn-Off Delay time	$t_{D(off)}$		-	85	-	ns
Turn-Off Fall time	t_f		-	57	-	ns
Reverse Recovery Time	t_{RR}	$V_{DD}=-20V, dI_S/dt =$ $100A/\mu s, I_S=-50A$	-	54	-	ns
Reverse Recovery Charge	Q_{RR}		-	60	-	nC

Fig.1 Gate-Charge Characteristics

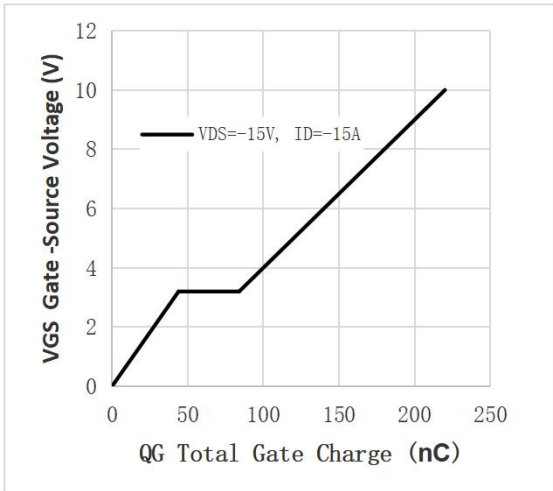


Fig.2 Capacitance Characteristics

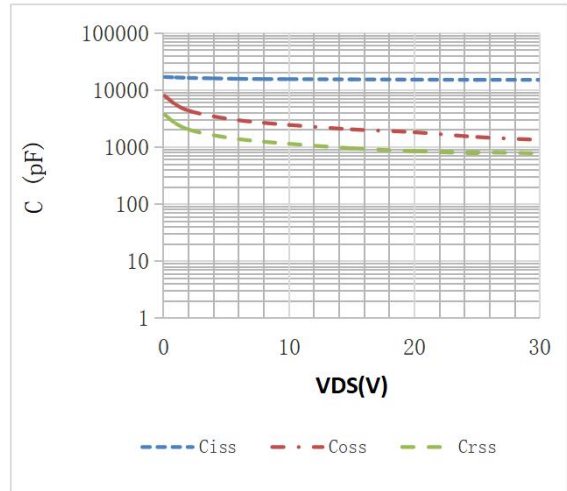


Fig.3 Power Dissipation

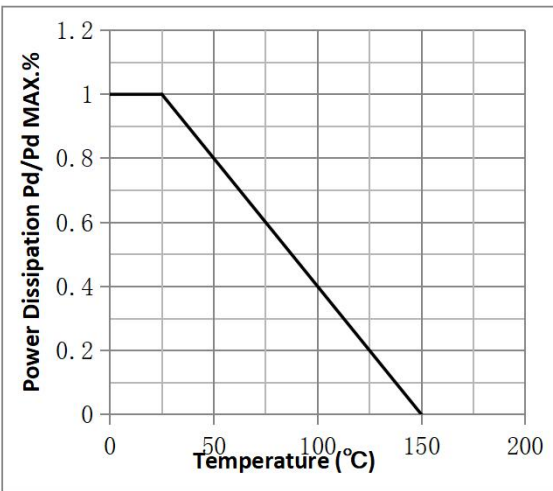


Fig.4 Typical output Characteristics

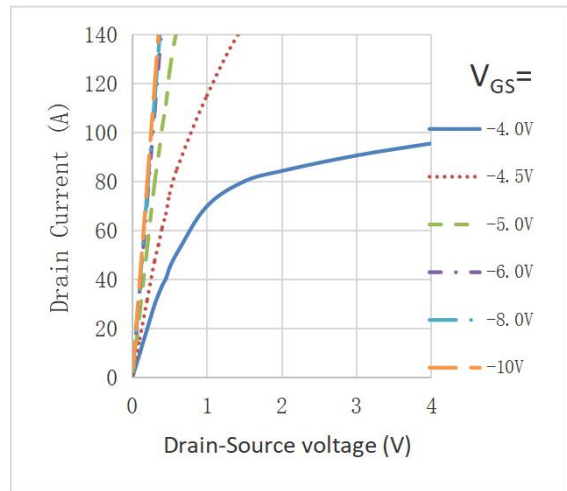


Fig.5 Threshold Voltage V.S Junction Temperature

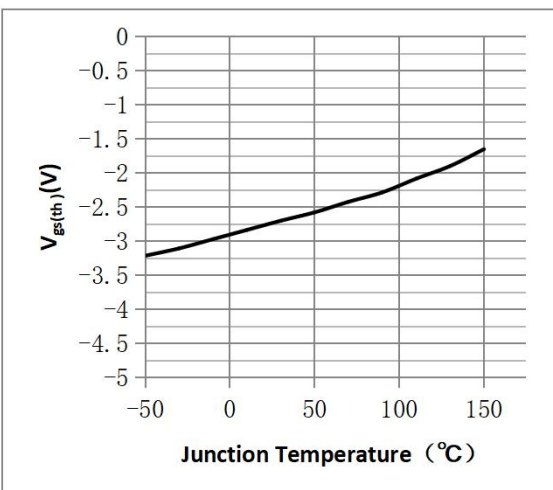


Fig.6 Resistance V.S Drain Current

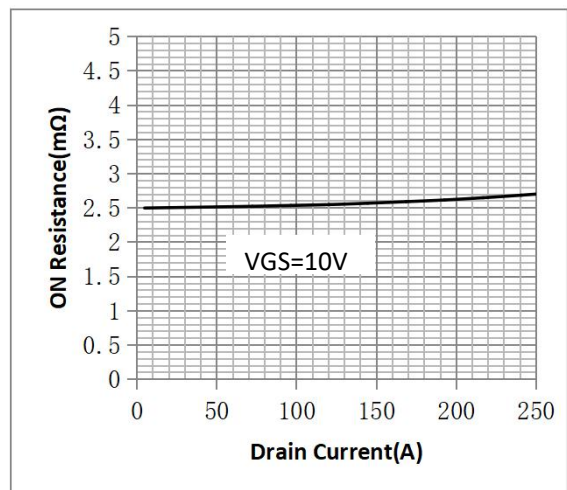


Fig.7 On-Resistance VS Gate Source Voltage

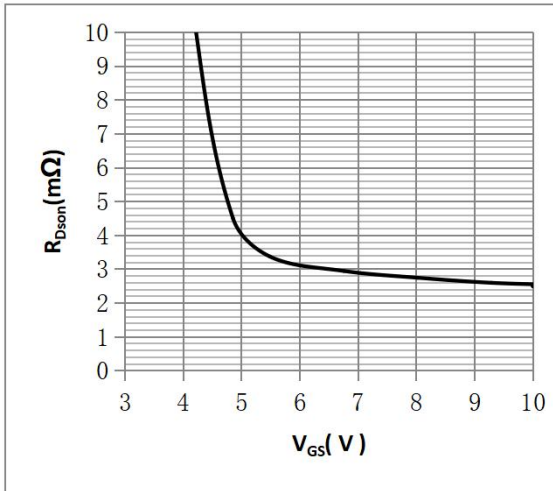


Fig.8 On-Resistance V.S Junction Temperature

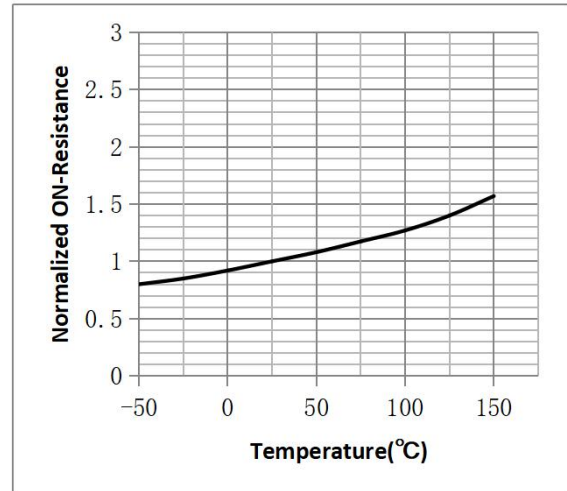


Figure 9. Diode Forward Voltage vs. Current

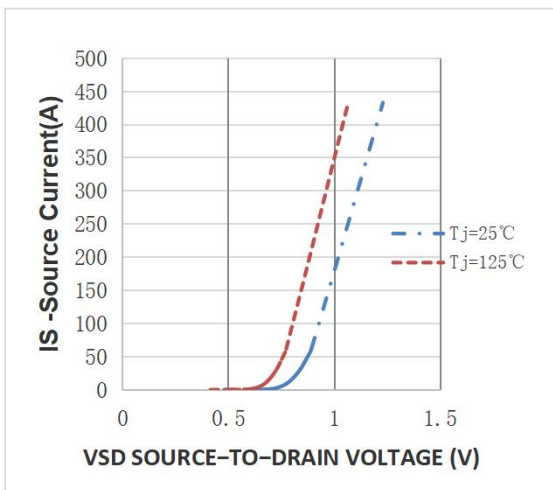


Figure 10. Transfer Characteristics

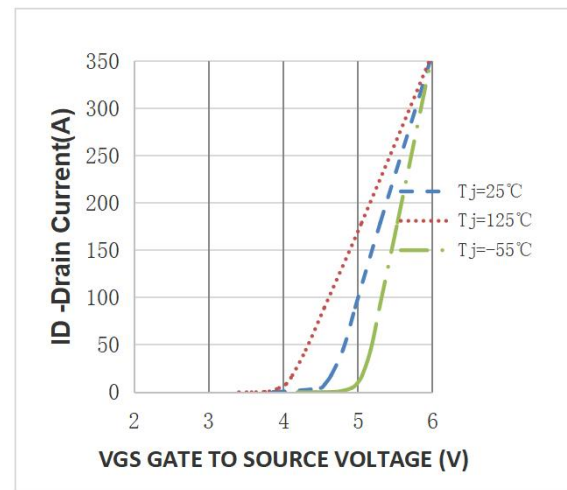


Fig.11 SOA Maximum Safe Operating Area

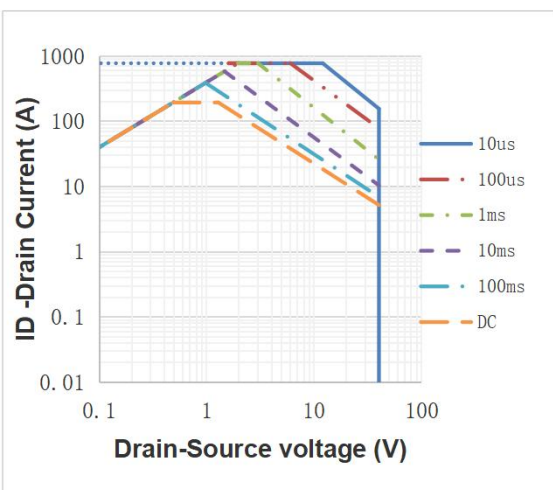
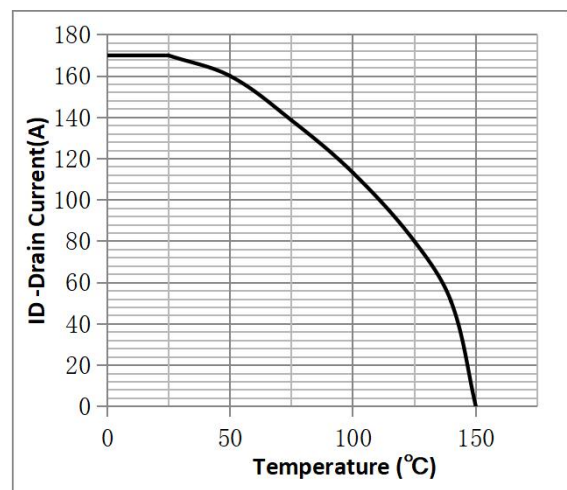
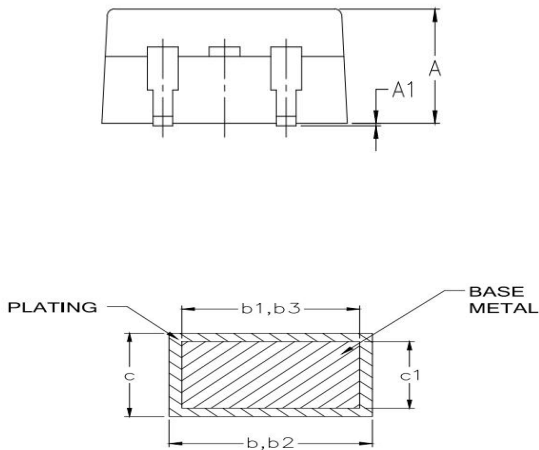
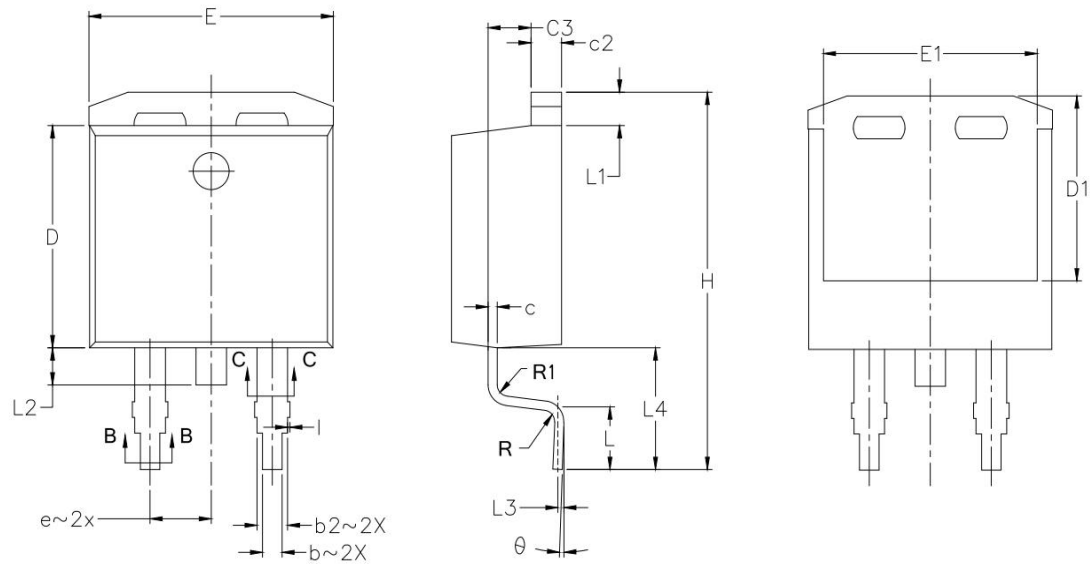


Fig.12 I_D vs. Case Temperature^②



•TO-263 Package Outline



NOTES:

- 1.Dimension D & E Does Not Include Mold Flash
- 2.Dimension b2 Does Not Include Protrusions

SYMBOLS	COMMON			
	MM		INCH	
	MIN.	MAX.	MIN.	MAX.
A	4.064	4.826	0.160	0.190
A1	0.000	0.254	0.000	0.010
b	0.508	0.991	0.020	0.039
b1	0.508	0.889	0.020	0.035
b2	1.143	1.778	0.045	0.070
b3	1.143	1.727	0.045	0.068
c	0.381	0.737	0.015	0.029
c1	0.381	0.584	0.015	0.023
c2	1.143	1.651	0.045	0.065
D	8.382	9.652	0.330	0.380
D1	6.858	—	0.270	—
E	9.652	10.668	0.380	0.420
E1	6.223	—	0.245	—
e	2.540 BSC.		0.100 BSC.	
H	14.605	15.875	0.575	0.625
L	1.778	2.794	0.070	0.110
L1	—	1.676	—	0.066
L2	—	1.778	—	0.070
L3	0.254 BSC		0.010 BSC	
L4	4.780	5.280	0.188	0.208
R	0.460 TYP		0.018 TYP	
R1	0.460 TYP		0.018 TYP	
θ	0°	8°	0°	8°
C3	1.68	1.88	0.0661	0.0740
I	—	0.100	—	0.0039

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	2023.09	NEW