## • 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

■High GOX reliability

■Low Thermal resistance

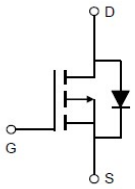
## •Application

■BLDC Motor driver

■DC-DC

■Load Switch

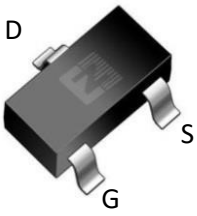
## • Product Summary




$V_{DS}$= -60V

$R_{DS(ON)}$ = 103mΩ

$I_D$= -2A




SOT-23-3

RoHS

REACH COMPLIANT

HF

## •Ordering Information:

| | |
|---|---|
| Part NO. | ZM930P06T |
| Marking | 930P06 |
| Packing Information | REEL TAPE |
| Basic ordering unit (pcs) | 3000 |

## •Absolute Maximum Ratings ($T_C$=25℃)

| Parameter | Symbol | Conditions | Value | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 25 °C ≤ $T_j$ ≤ 150 °C | -60 | V |
| Gate-Source Voltage | $V_{GS}$ | | ±20 | V |
| Continuous Drain Current | $I_D$ | $T_C$=25℃ | -2.0 | A |
| | $I_D$ | $T_C$=75℃ | -1.98 | A |
| | $I_D$ | $T_C$=100℃ | -1.59 | A |
| Pulsed Drain Current | $I_{DM}$ | Pulsed; $t_p$ ≤ 10 μs; $T_{mb}$ = 25 °C; | -8 | 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, VGS=10V, Rg=25Ω, | 1.2 | mJ |
| | | L=0.5mH, VGS=10V, Rg=25Ω, | 2.52 | 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 | -60 | | | 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, $V_{DS}$= -60V | | | 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, $I_D$= -1.5A | | 103 | 130 | mΩ |
| | | $V_{GS}$=4.5V, $I_D$= -1A | | 128 | 166 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{GS}$ =5V, $I_{SD}$ = -1A | | 20 | | s |
| Diode Forward Voltage | $V_{FSD}$ | $V_{GS}$ =0V, $I_{SD}$ = -1.5A | | | 1.3 | V |

## •Dynamic characteristics

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Input capacitance | Ciss | f = 1MHz, $V_{DS}$=-25V | - | 650 | - | pF |
| Output capacitance | Coss | | - | 95 | - | |
| Reverse transfer capacitance | Crss | | - | 70 | - | |
| Gate Risistance | Rg | f = 1MHz | - | 8 | | Ω |
| Total gate charge | Qg | $V_{DD}$ = -15V, $I_D$ = -1A, $V_{GS}$ = -10V | - | 12 | - | nC |
| | Qg(-4.5v) | | - | 21 | - | |
| Gate - Source charge | Qgs | | - | 1.6 | - | |
| Gate - Drain charge | Qgd | | - | 2.6 | - | |
| Turn-ON Delay time | $t_{D(on)}$ | $V_{GS}$=-10V,$V_{DS}$=-15V, $R_G$ =3.3Ω, $I_D$ =-1A | - | 6.5 | - | ns |
| Turn-ON Rise time | $t_r$ | | - | 8 | - | ns |
| Turn-Off Delay time | $t_{D(off)}$ | | - | 16.5 | - | ns |
| Turn-Off Fall time | $t_f$ | | - | 4 | - | ns |
| Reverse Recovery Time | $t_{RR}$ | $V_{DD}$=-20V, $dI_S/dt$ = 100A/us, $I_S$=-2A | - | 55 | - | ns |
| Reverse Recovery Charge | $Q_{RR}$ | | - | 136 | - | nC |

Fig.1 Gate-Charge Characteristics

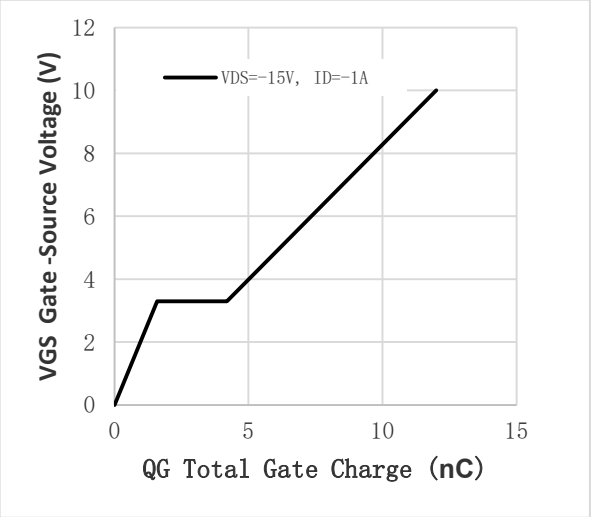



Fig.2 Capacitance Characteristics

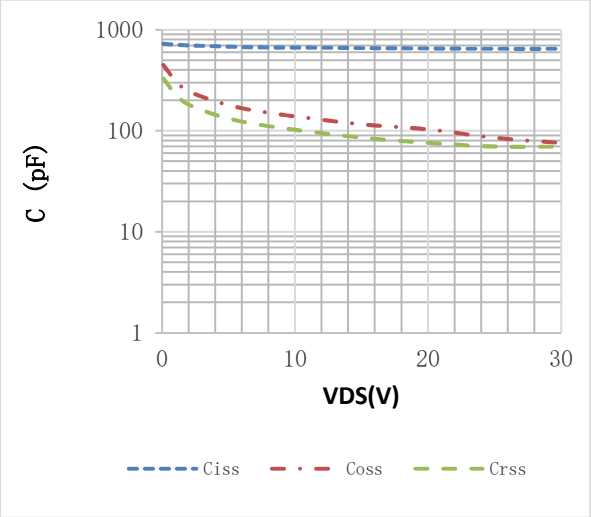



Fig.3 Power Dissipation

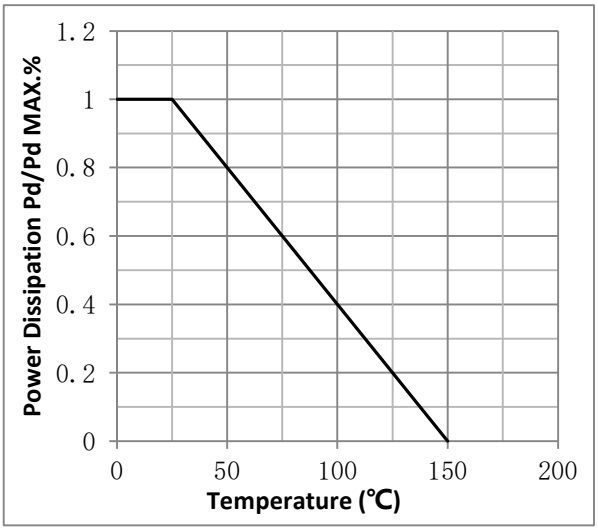



Fig.4 Typical output Characteristics

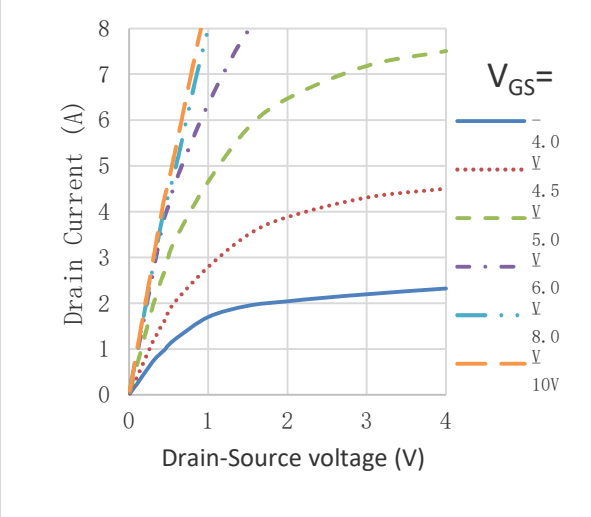



Fig.5 Threshold Voltage V.S Junction Temperature

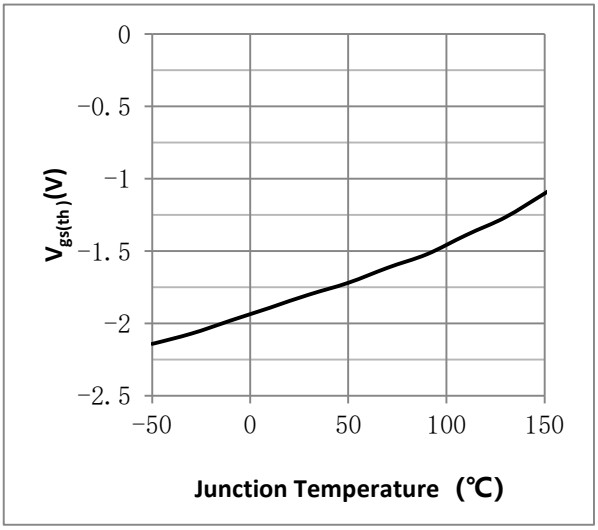



Fig.6 Resistance V.S Drain Current

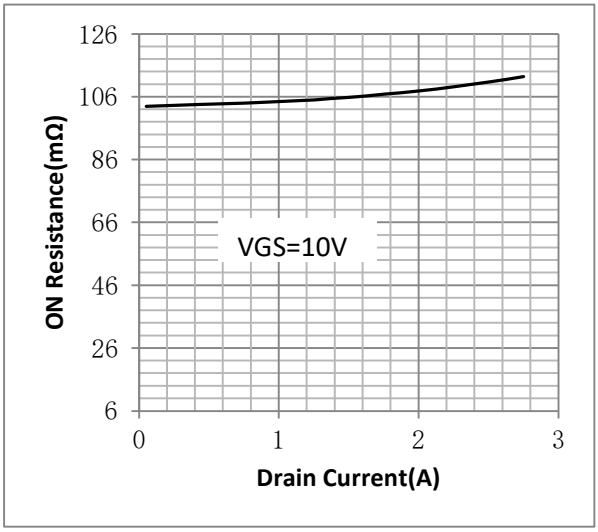


Fig.7 On-Resistance VS Gate Source Voltage

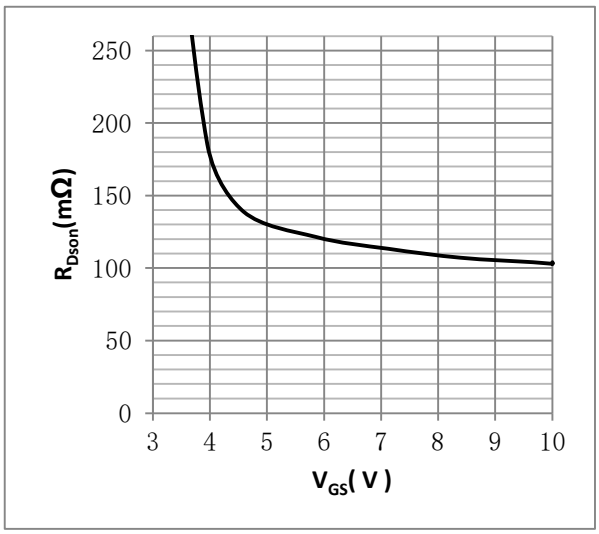



Fig.8 On-Resistance V.S Junction Temperature

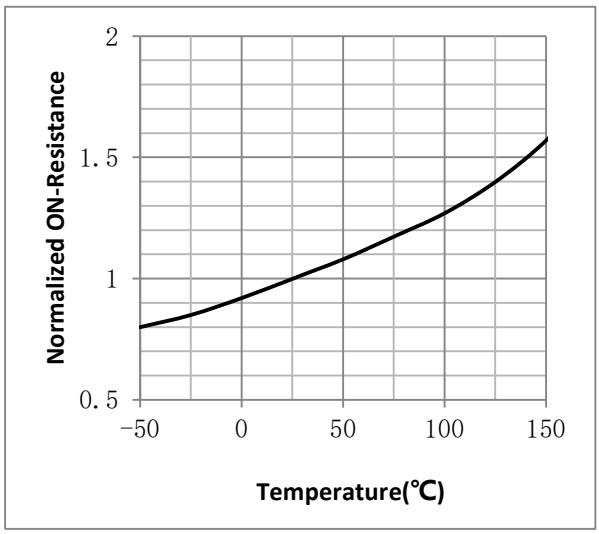



Figure 9. Diode Forward Voltage vs. Current

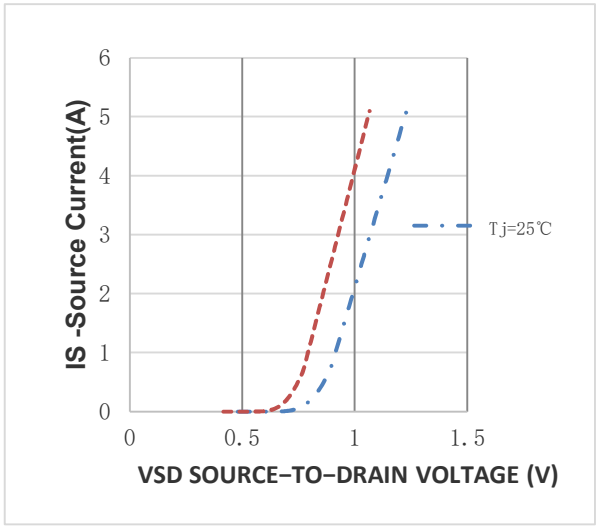



Figure 10. Transfer Characteristics

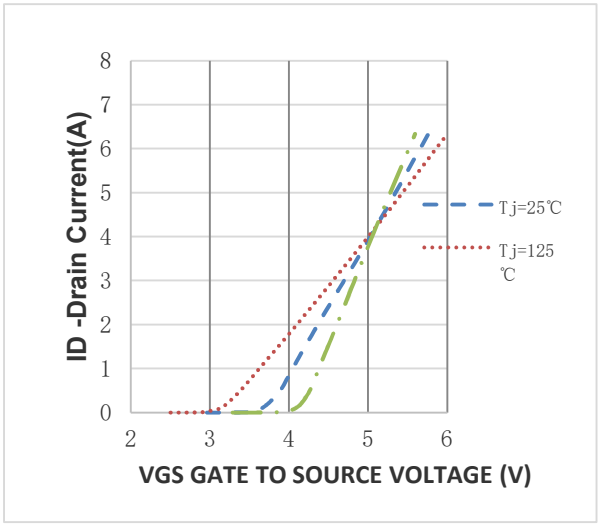



Fig.11 SOA Maximum Safe Operating Area

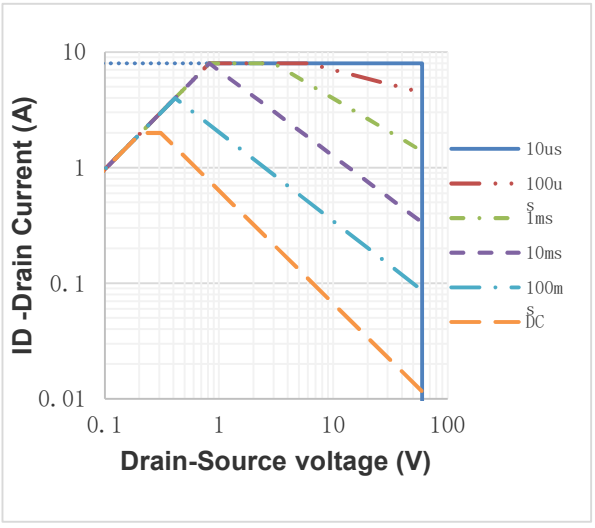
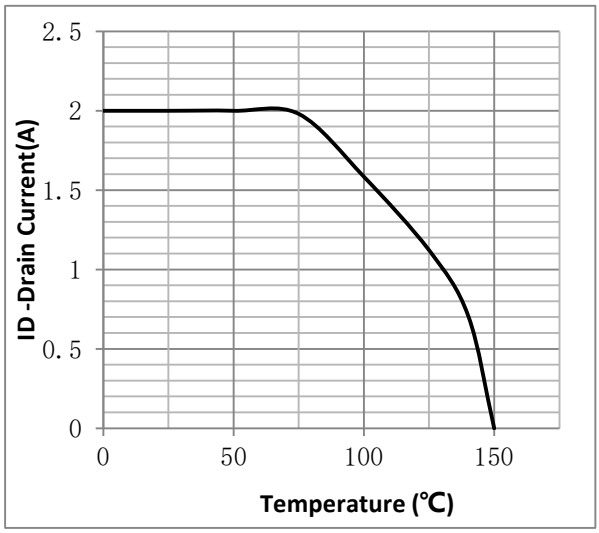
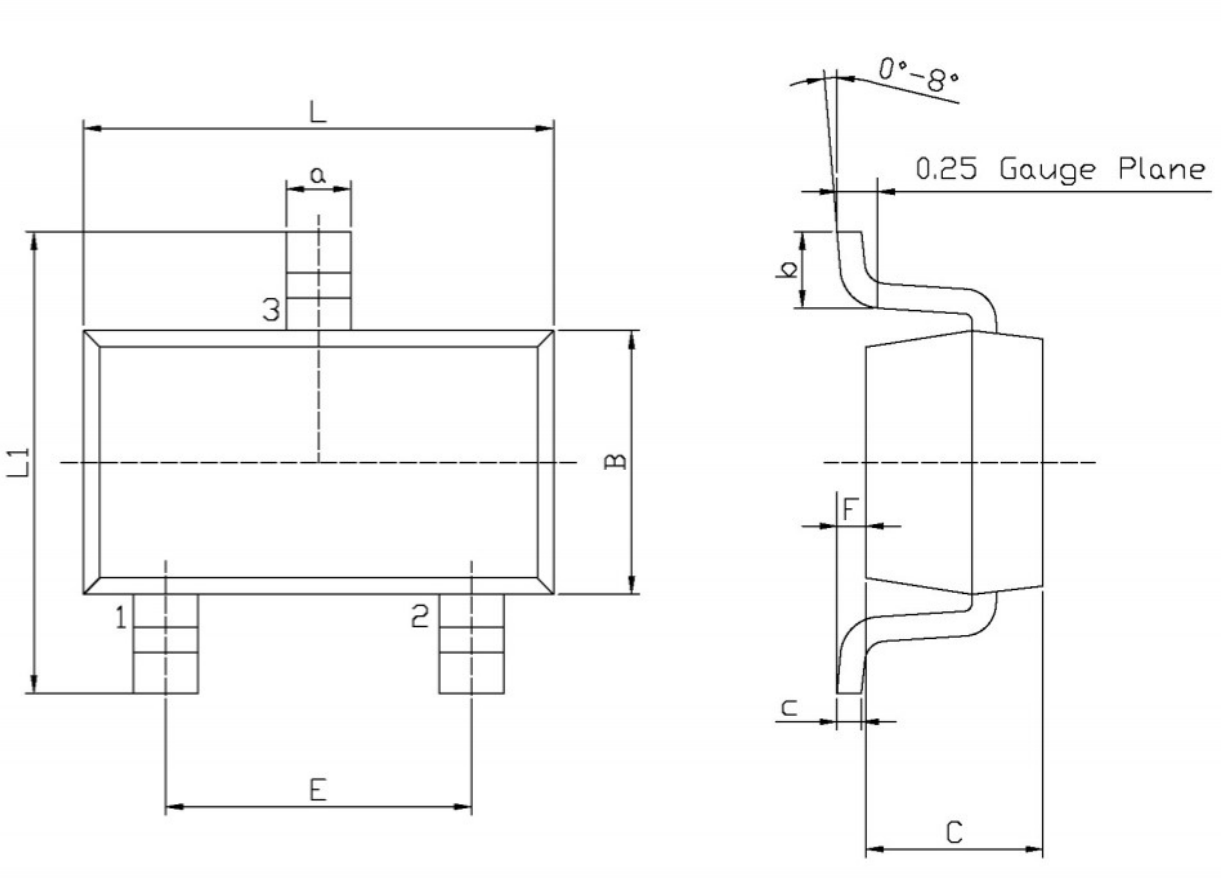



Fig.12 ID vs. Case Temperature②



## ●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；

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

## Disclaimer

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Revision History

| Version | Date | Change |
|---|---|---|
| A | 2019.3.6 | NEW |
| B | 2021.9.7 | 1.Add Reach,HF figure |
| C | 2022.9.9 | 1.Add Dynamic characteristics |
| D | 2022.10.30 | Add SOA/ID Figure |
| E | 2024.5.20 | Modify curves. |
| | | |
| | | |
| | | |