# -100V P-Channel Enhancement Mode MOSFET

## Description

The SX40P10D uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

## General Features

$V_{DS}$ = -100V $I_D$ =-40A

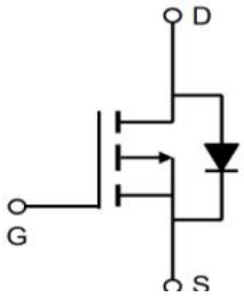
$R_{DS(ON)}$ <50mΩ @ $V_{GS}$=10V

## Application

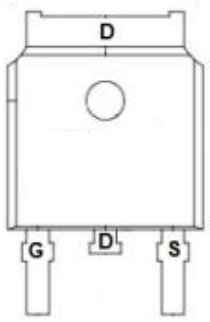
Brushless motor

Load switch

Uninterruptible power supply




TO-252-3L


## Absolute Maximum Ratings ($T_C$=25℃unless otherwise noted)

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| VDS | Drain-Source Voltage | -100 | V |
| VGS | Gate-Source Voltage | ±20 | V |
| $I_D$@$T_C$=25℃ | Continuous Drain Current, $V_{GS}$ @ -10V[1] | -40 | A |
| $I_D$@$T_C$=100℃ | Continuous Drain Current, $V_{GS}$ @ -10V[1] | -29 | A |
| IDM | Pulsed Drain Current[2] | -120 | A |
| EAS | Single Pulse Avalanche Energy[3] | 560 | mJ |
| IAS | Avalanche Current | -29 | A |
| $P_D$@$T_C$=25℃ | Total Power Dissipation[4] | 104 | W |
| TSTG | Storage Temperature Range | -55 to 150 | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | ℃ |
| $R_{\theta}JA$ | Thermal Resistance Junction-Ambient [1] | 62.5 | ℃/W |
| $R_{\theta}JC$ | Thermal Resistance Junction-Case[1] | 1.22 | ℃/W |

## P-Channel Electrical Characteristics (TJ =25 ℃, unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| BVDSS | Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=-250uA | -100 | -110 | --- | V |
| RDS(ON) | Static Drain-Source On-Resistance[2] | $V_{GS}$=-10V , $I_D$=-10A | --- | 38 | 50 | mΩ |
| | | $V_{GS}$=-4.5V , $I_D$=-8A | --- | 40 | 52 | |
| VGS(th) | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =-250uA | -1.2 | -1.8 | -2.5 | V |
| IDSS | Drain-Source Leakage Current | $V_{DS}$=-100V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | -1 | uA |
| IGSS | Gate-Source Leakage Current | $V_{GS}$=±20V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| gfs | Forward Transconductance | $V_{DS}$=-10V , $I_D$=-10A | --- | 32 | --- | S |
| $Q_g$ | Total Gate Charge | $V_{DS}$=-80V<br>$V_{GS}$=-10V<br>$I_D$=-14A | --- | 92 | --- | nC |
| Qgs | Gate-Source Charge | | --- | 17.5 | --- | |
| Qgd | Gate-Drain Charge | | --- | 14 | --- | |
| Td(on) | Turn-On Delay Time | $V_{DD}$=-50V ,$V_{GS}$=-10V<br>,$R_G$=3.3Ω,$I_D$=-14A | --- | 20.5 | --- | ns |
| $T_r$ | Rise Time | | --- | 32.2 | --- | |
| Td(off) | Turn-Off Delay Time | | --- | 123 | --- | |
| $T_f$ | Fall Time | | --- | 63.7 | --- | |
| Ciss | Input Capacitance | $V_{DS}$=-25V, $V_{GS}$=0V, f=1MHz | --- | 6516 | --- | pF |
| Coss | Output Capacitance | | --- | 223 | --- | |
| Crss | Reverse Transfer Capacitance | | --- | 125 | --- | |
| IS | Continuous Source Current[1,5] | $V_G$=$V_D$=0V , Force Current | --- | --- | -40 | A |
| VSD | Diode Forward Voltage[2] | $V_{GS}$=0V , $I_S$=-1A , $T_J$=25℃ | --- | --- | -1.2 | V |
| trr | Reverse Recovery Time | IF=-14A , di/dt=-100A/μs ,<br>$T_J$=25℃ | --- | 31.2 | --- | nS |
| $Q_{rr}$ | Reverse Recovery Charge | | --- | 31.97 | --- | nC |

Note :
1、The data tested by surface mounted on a 1 inch 2 FR-4 board with 2OZ copper.
2、The data tested by pulsed , pulse width ≦300us , duty cycle ≦2%
3、The EAS data shows Max. rating . The test condition is V DD =-25V,V GS =-10V,L=0.1mH,IAS =-29A
4、The power dissipation is limited by 150℃junction temperature
5、The data is theoretically the same as I D and I DM , in real applications , should be limited by total power dissipation.

## Typical Characteristics

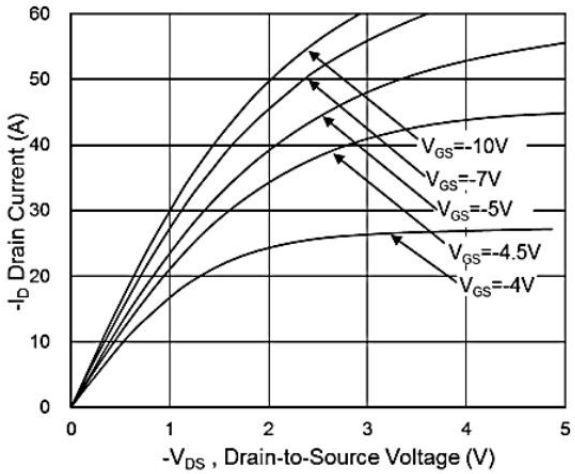



Fig.1 Typical Output Characteristics

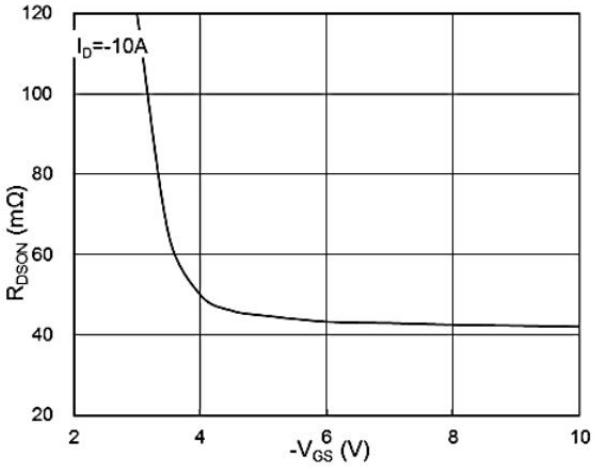



Fig.2 On-Resistance vs G-S Voltage

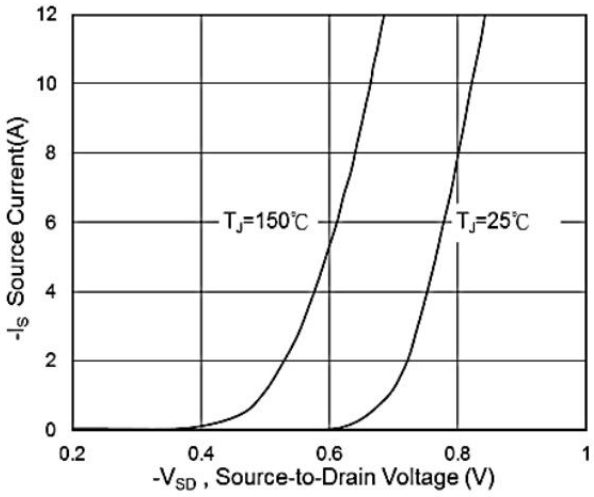



Fig.3 Typical S-D Diode Forward Voltage

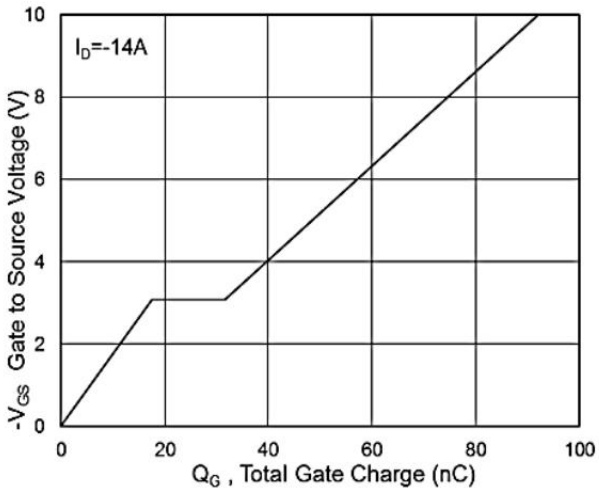



Fig.4 Gate-Charge Characteristics

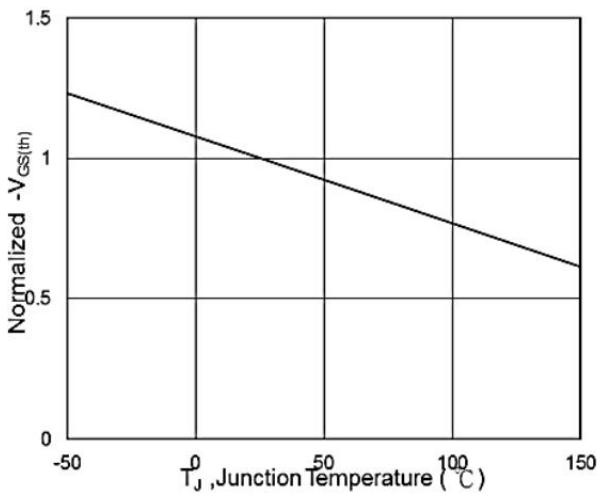



Fig.5 Normalized $V_{GS(th)}$ vs $T_J$

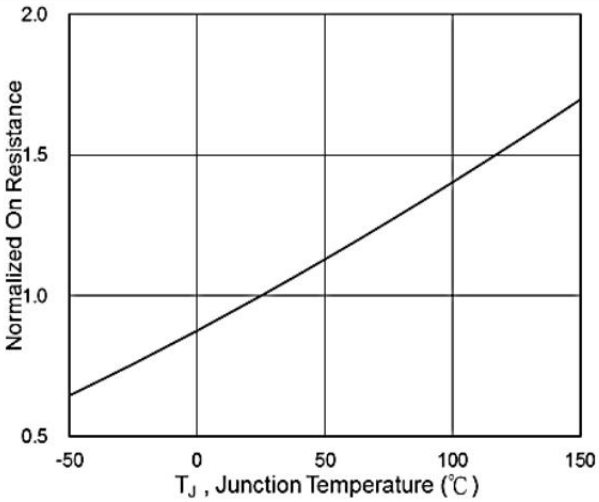



Fig.6 Normalized $R_{DSON}$ vs $T_J$

## Typical Characteristics

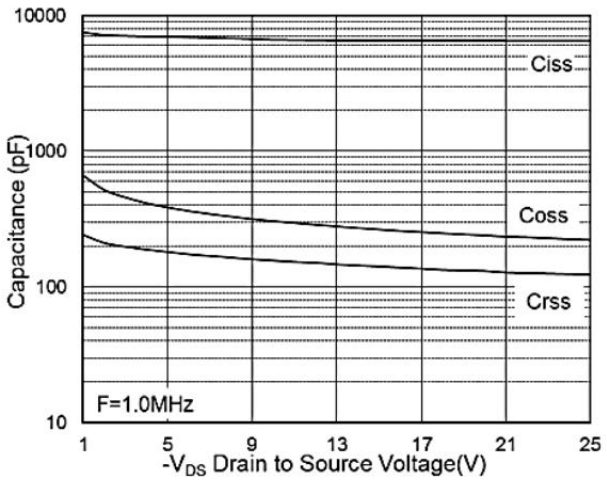



Fig.7 Capacitance

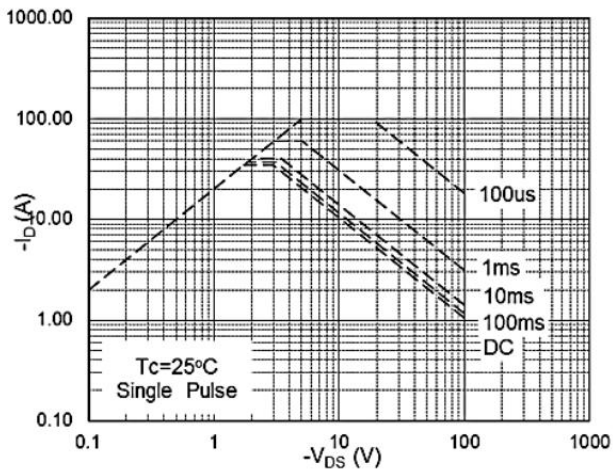



Fig.8 Safe Operating Area

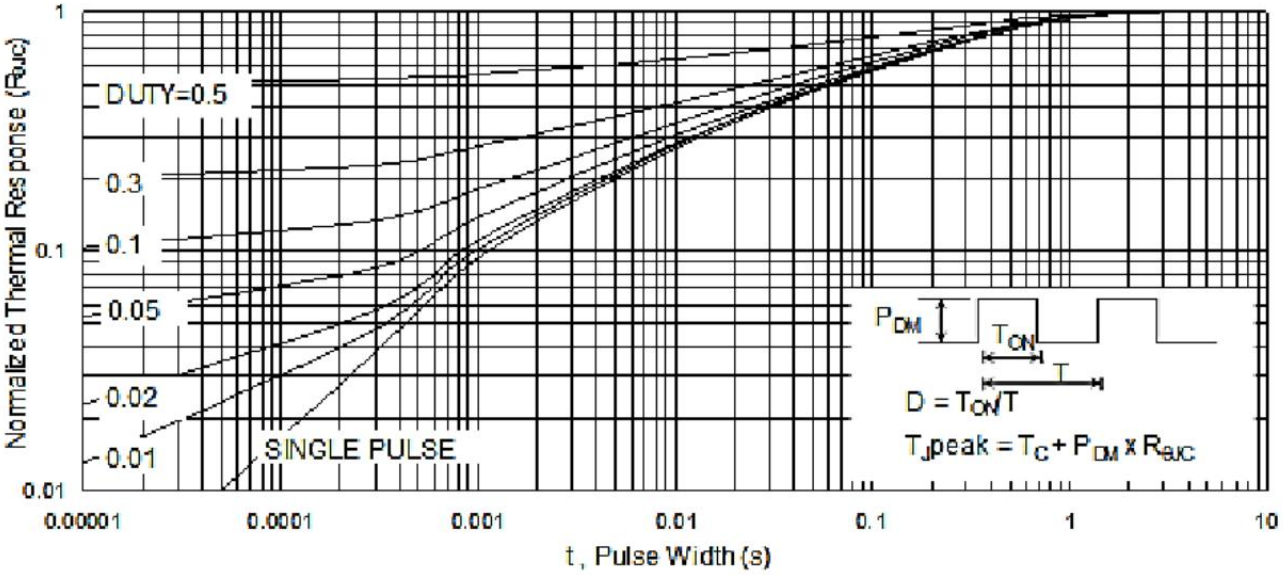



Fig.9 Normalized Maximum Transient Thermal Impedance

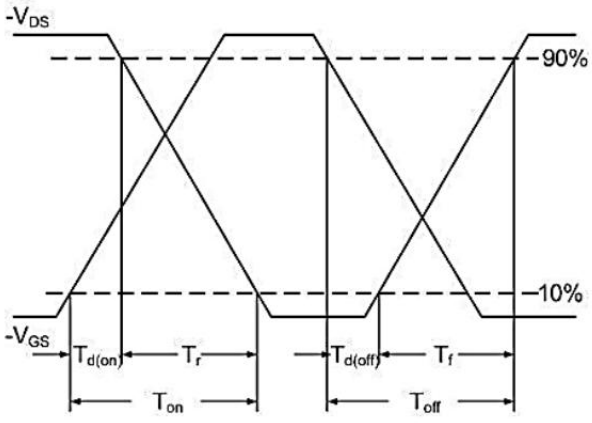



Fig.10 Switching Time Waveform

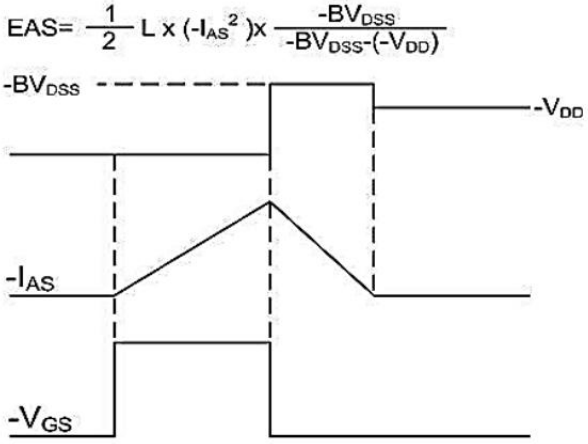
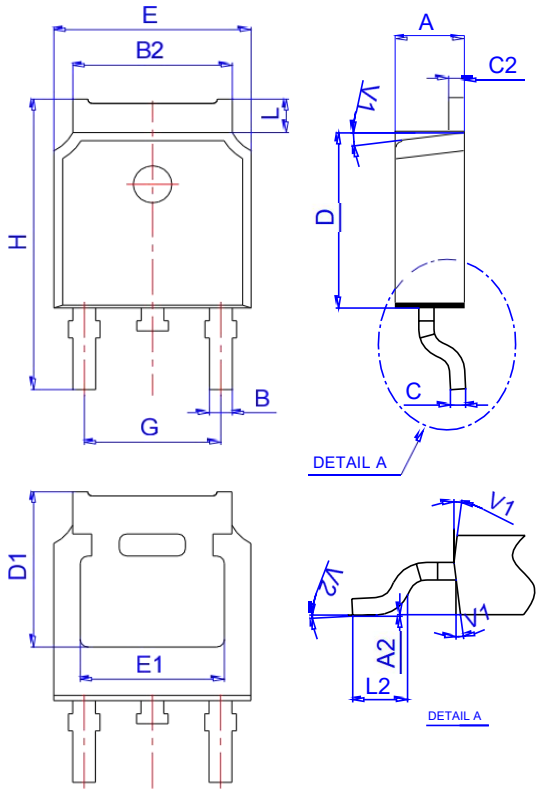



Fig.11 Unclamped Inductive Waveform

## Package Mechanical Data:TO-252-3L




| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 2.10 | | 2.50 | 0.083 | | 0.098 |
| A2 | 0 | | 0.10 | 0 | | 0.004 |
| B | 0.66 | | 0.86 | 0.026 | | 0.034 |
| B2 | 5.18 | | 5.48 | 0.202 | | 0.216 |
| C | 0.40 | | 0.60 | 0.016 | | 0.024 |
| C2 | 0.44 | | 0.58 | 0.017 | | 0.023 |
| D | 5.90 | | 6.30 | 0.232 | | 0.248 |
| D1 | 5.30REF | | | 0.209REF | | |
| E | 6.40 | | 6.80 | 0.252 | | 0.268 |
| E1 | 4.63 | | | 0.182 | | |
| G | 4.47 | | 4.67 | 0.176 | | 0.184 |
| H | 9.50 | | 10.70 | 0.374 | | 0.421 |
| L | 1.09 | | 1.21 | 0.043 | | 0.048 |
| L2 | 1.35 | | 1.65 | 0.053 | | 0.065 |
| V1 | | 7° | | | 7° | |
| V2 | 0° | | 6° | 0° | | 6° |

### Package Marking and Ordering Information

| Product ID | Pack | Marking | Qty(PCS) |
|---|---|---|---|
| TAPING | TO-252-3L | | 2500 |