

TM50P06D

p-Channel Enhancement Mosfet

General Description

- Low $R_{DS(ON)}$
- RoHS and Halogen-Free Compliant

Applications

- Load switch
- PWM

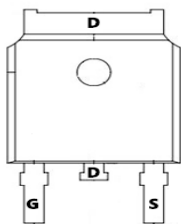
General Features

$V_{DS} = -60V$ $I_D = -50A$

$R_{DS(ON)} = 20m\Omega$ (typ.) @ $V_{GS} = -10V$

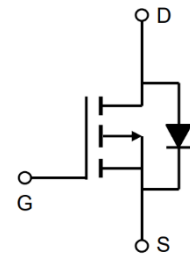
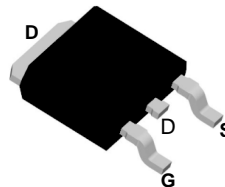
100% UIS Tested

100% R_g Tested



Marking: 50P06

D:TO-252-3L



Absolute Maximum Ratings (TC=25°C unless otherwise noted)

| Symbol | Parameter | Rating | Units |
|---------------------------|--|------------|------------|
| V_{DS} | Drain-Source Voltage | -60 | V |
| V_{GS} | Gate-Source Voltage | ± 20 | V |
| $I_D @ T_C = 25^\circ C$ | Continuous Drain Current, $-V_{GS} @ -10V^1$ | -50 | A |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current, $-V_{GS} @ -10V^1$ | -32 | A |
| I_{DM} | Pulsed Drain Current ² | -185 | A |
| EAS | Single Pulse Avalanche Energy ³ | 113 | mJ |
| I_{AS} | Avalanche Current | 47.6 | A |
| $P_D @ T_C = 25^\circ C$ | Total Power Dissipation ⁴ | 52.1 | W |
| T_{STG} | Storage Temperature Range | -55 to 150 | $^\circ C$ |
| T_J | Operating Junction Temperature Range | -55 to 150 | $^\circ C$ |

Thermal Data

| Symbol | Parameter | Typ. | Max. | Unit |
|-----------------|--|------|------|--------------|
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient ¹ | --- | 62 | $^\circ C/W$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case ¹ | --- | 2.4 | $^\circ C/W$ |



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Electrical Characteristics (T_J=25 °C, unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------------|--|--|------|--------|------|-------|
| BV _{DSS} | Drain-Source Breakdown Voltage | V _{GS} =0V, I _D =-250uA | -60 | --- | --- | V |
| ΔBV _{DSS} /ΔT _J | BV _{DSS} Temperature Coefficient | Reference to 25°C, I _D =-1mA | --- | -0.035 | --- | V/°C |
| R _{DS(ON)} | Static Drain-Source On-Resistance ² | V _{GS} =-10V, I _D =-18A | --- | 20 | 24 | mΩ |
| | | V _{GS} =-4.5V, I _D =-12A | --- | 25 | 30 | |
| V _{GS(th)} | Gate Threshold Voltage | V _{GS} =V _{DS} , I _D =-250uA | -1.0 | 1.6 | -2.5 | V |
| ΔV _{GS(th)} | V _{GS(th)} Temperature Coefficient | | --- | 4.28 | --- | mV/°C |
| I _{DSS} | Drain-Source Leakage Current | V _{DS} =-48V, V _{GS} =0V, T _J =25°C | --- | --- | 1 | uA |
| | | V _{DS} =-48V, V _{GS} =0V, T _J =55°C | --- | --- | 5 | |
| I _{GSS} | Gate-Source Leakage Current | V _{GS} =±20V, V _{DS} =0V | --- | --- | ±100 | nA |
| g _{fs} | Forward Transconductance | V _{DS} =-10V, I _D =-18A | --- | 23 | --- | S |
| R _g | Gate Resistance | V _{DS} =0V, V _{GS} =0V, f=1MHz | --- | 7 | --- | Ω |
| Q _g | Total Gate Charge (-4.5V) | V _{DS} =-20V, V _{GS} =-4.5V, I _D =-12A | --- | 25 | --- | nC |
| Q _{gs} | Gate-Source Charge | | --- | 6.7 | --- | |
| Q _{gd} | Gate-Drain Charge | | --- | 5.5 | --- | |
| T _{d(on)} | Turn-On Delay Time | V _{DD} =-15V, V _{GS} =-10V, R _G =3.3Ω, I _D =-1A | --- | 38 | --- | ns |
| T _r | Rise Time | | --- | 23.6 | --- | |
| T _{d(off)} | Turn-Off Delay Time | | --- | 100 | --- | |
| T _f | Fall Time | | --- | 6.8 | --- | |
| C _{iss} | Input Capacitance | V _{DS} =-15V, V _{GS} =0V, f=1MHz | --- | 3635 | --- | pF |
| C _{oss} | Output Capacitance | | --- | 224 | --- | |
| C _{rss} | Reverse Transfer Capacitance | | --- | 141 | --- | |

Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-----------------|--|--|------|------|------|------|
| I _S | Continuous Source Current ^{1,5} | V _G =V _D =0V, Force Current | --- | --- | -50 | A |
| I _{SM} | Pulsed Source Current ^{2,5} | | --- | --- | -70 | A |
| V _{SD} | Diode Forward Voltage ² | V _{GS} =0V, I _S =-1A, T _J =25°C | --- | --- | -1 | V |

Note :

- 1.The data tested by surface mounted on a 1 inch² 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, I_{AS}=-47.6A
- 4.The power dissipation is limited by 150°C 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.



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Typical Characteristics

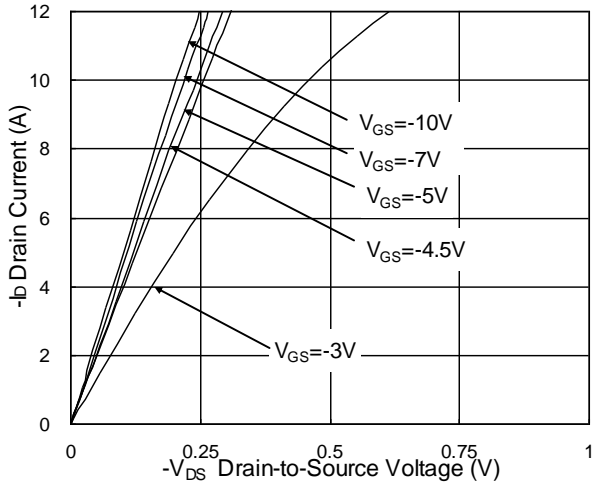


Fig.1 Typical Output Characteristics

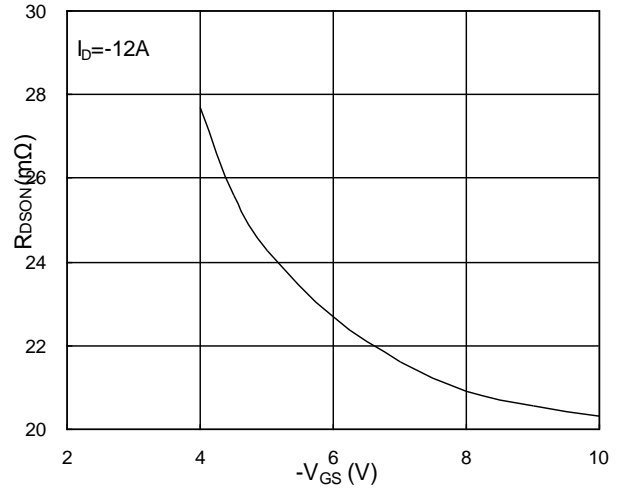


Fig.2 On-Resistance v.s Gate-Source

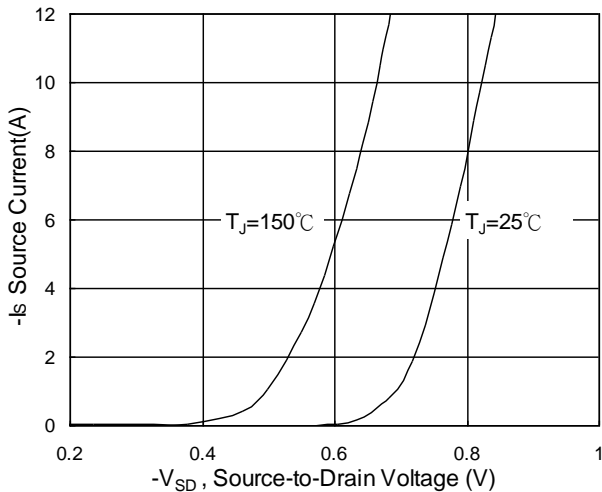


Fig.3 Forward Characteristics Of Reverse

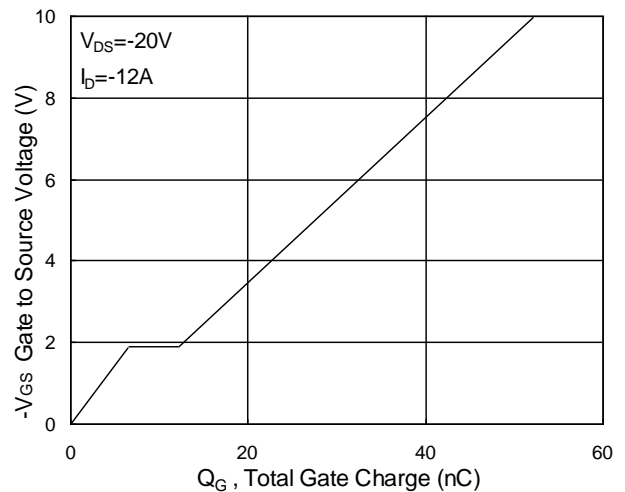


Fig.4 Gate-Charge Characteristics

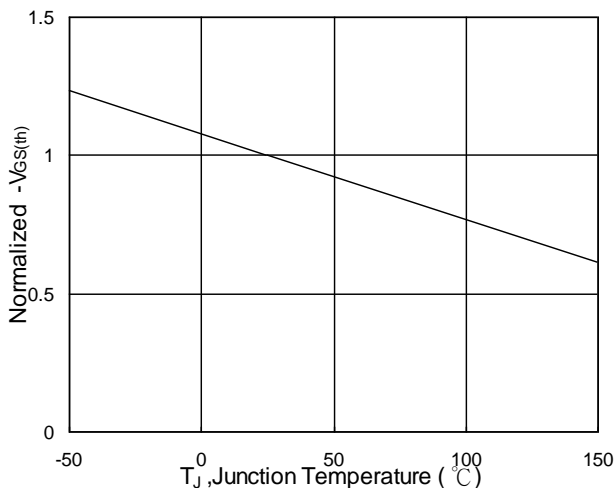


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

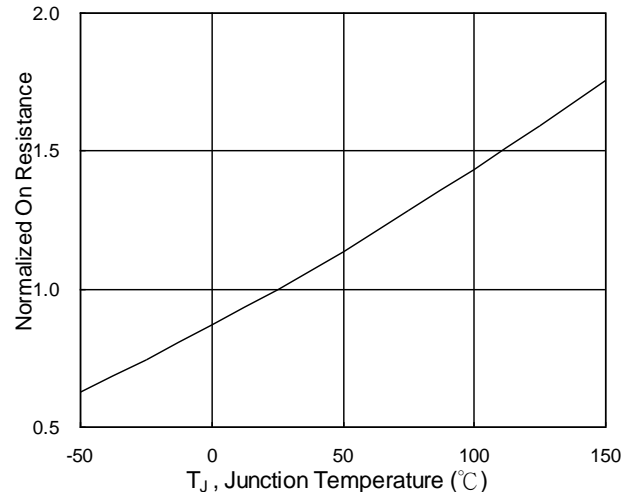


Fig.6 Normalized $R_{DS(on)}$ v.s T_J

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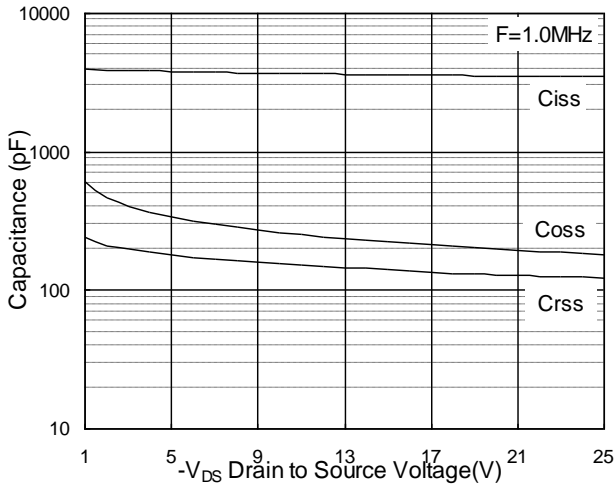


Fig.7 Capacitance

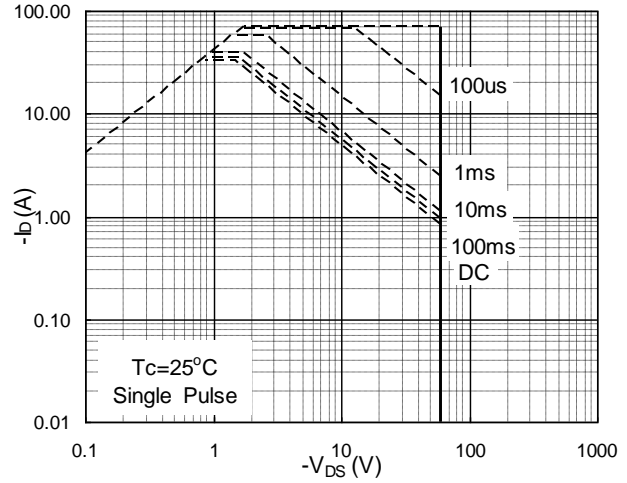


Fig.8 Safe Operating Area

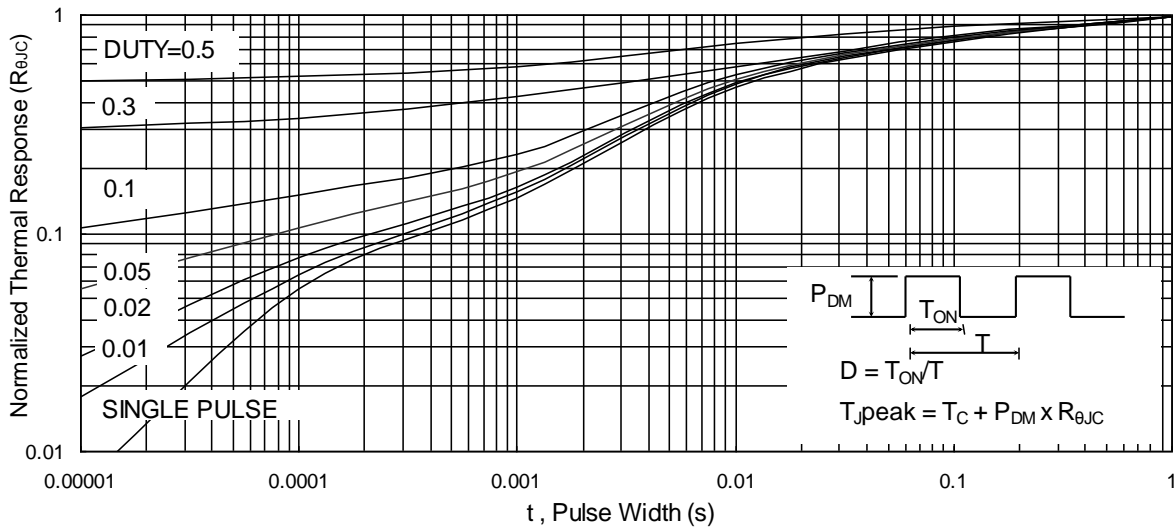


Fig.9 Normalized Maximum Transient Thermal Impedance

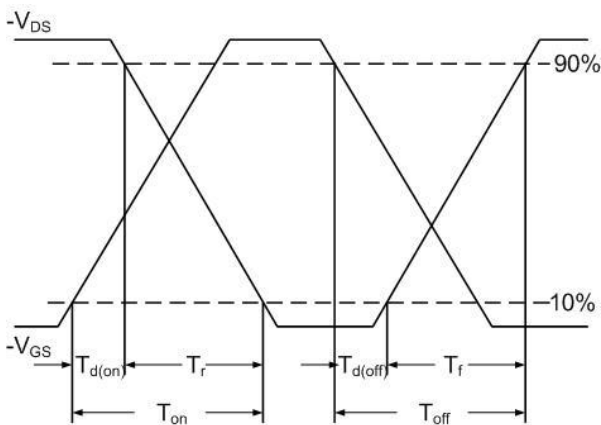


Fig.10 Switching Time Waveform

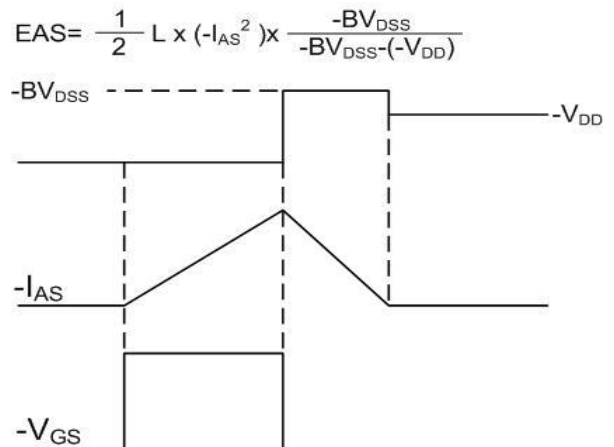
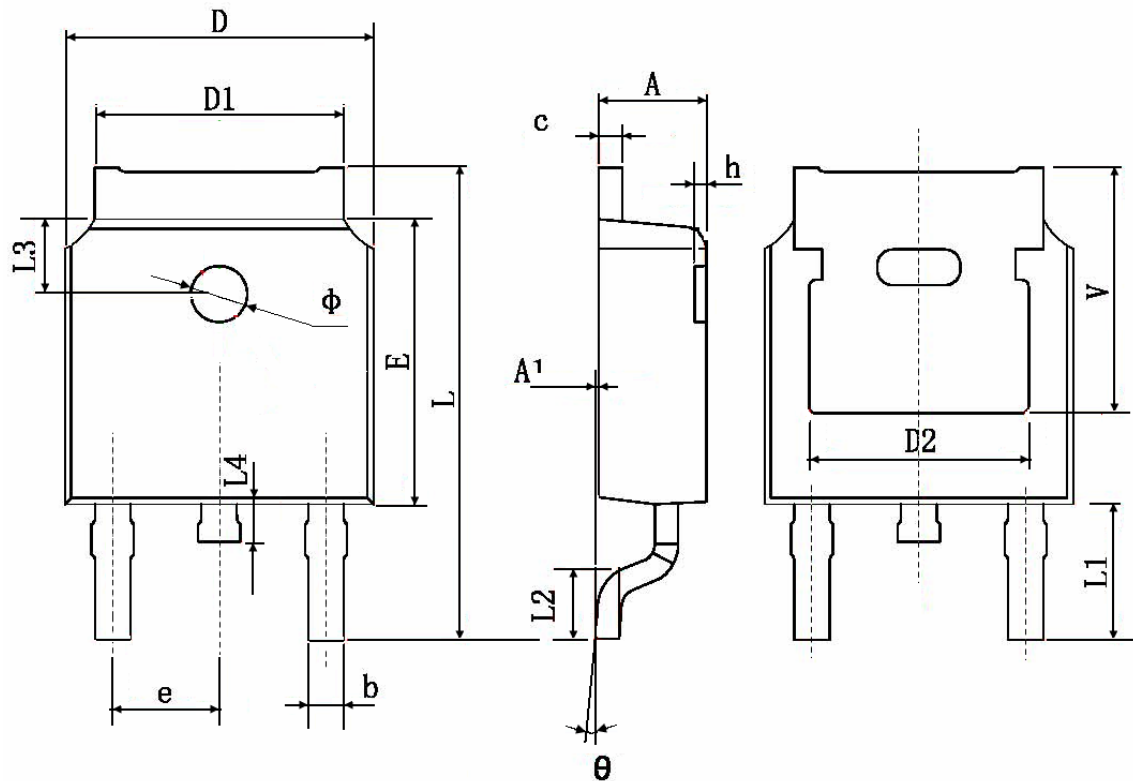


Fig.11 Unclamped Inductive Waveform

$$EAS = \frac{1}{2} L \times (-I_{AS}^2) \times \frac{-BV_{DSS}}{-BV_{DSS} - (-V_{DD})}$$

Package Information:TO-252-3L



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|--------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 2.200 | 2.400 | 0.087 | 0.094 |
| A1 | 0.000 | 0.127 | 0.000 | 0.005 |
| b | 0.660 | 0.860 | 0.026 | 0.034 |
| c | 0.460 | 0.580 | 0.018 | 0.023 |
| D | 6.500 | 6.700 | 0.256 | 0.264 |
| D1 | 5.100 | 5.460 | 0.201 | 0.215 |
| D2 | 4.830 TYP. | | 0.190 TYP. | |
| E | 6.000 | 6.200 | 0.236 | 0.244 |
| e | 2.186 | 2.386 | 0.086 | 0.094 |
| L | 9.800 | 10.400 | 0.386 | 0.409 |
| L1 | 2.900 TYP. | | 0.114 TYP. | |
| L2 | 1.400 | 1.700 | 0.055 | 0.067 |
| L3 | 1.600 TYP. | | 0.063 TYP. | |
| L4 | 0.600 | 1.000 | 0.024 | 0.039 |
| φ | 1.100 | 1.300 | 0.043 | 0.051 |
| θ | 0° | 8° | 0° | 8° |
| h | 0.000 | 0.300 | 0.000 | 0.012 |
| V | 5.350 TYP. | | 0.211 TYP. | |