

N-Ch 60V Fast Switching MOSFETs
General Description

The UD6006 is the highest performance trench N-ch MOSFETs with extreme high cell density, which provide excellent R_{DS(ON)} and gate charge for most of the synchronous buck converter applications.

The UD6006 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- 100% EAS Guaranteed
- Green Device Available

Absolute Maximum Ratings

| Symbol | Parameter | Rating | Units |
|---------------------------------------|--|------------|-------|
| V _{DS} | Drain-Source Voltage | 60 | V |
| V _{GS} | Gate-Source Voltage | ±20 | V |
| I _D @T _C =25°C | Continuous Drain Current, V _{GS} @ 10V ¹ | 35 | A |
| I _D @T _C =100°C | Continuous Drain Current, V _{GS} @ 10V ¹ | 22 | A |
| I _D @T _A =25°C | Continuous Drain Current, V _{GS} @ 10V ¹ | 7.4 | A |
| I _D @T _A =70°C | Continuous Drain Current, V _{GS} @ 10V ¹ | 6 | A |
| I _{DM} | Pulsed Drain Current ² | 80 | A |
| EAS | Single Pulse Avalanche Energy ³ | 67 | mJ |
| I _{AS} | Avalanche Current | 28 | A |
| P _D @T _C =25°C | Total Power Dissipation ⁴ | 45 | W |
| P _D @T _A =25°C | Total Power Dissipation ⁴ | 2 | W |
| T _{STG} | Storage Temperature Range | -55 to 150 | °C |
| T _J | Operating Junction Temperature Range | -55 to 150 | °C |

Thermal Data

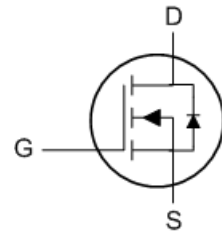
| Symbol | Parameter | Typ. | Max. | Unit |
|------------------|--|------|------|------|
| R _{θJA} | Thermal Resistance Junction-Ambient ¹ | --- | 62 | °C/W |
| R _{θJC} | Thermal Resistance Junction-Case ¹ | --- | 2.8 | °C/W |

Product Summary

| BV _{DSS} | R _{DS(ON)} | ID |
|-------------------|---------------------|-----|
| 60V | 18mΩ | 35A |

Applications

- High Frequency Point-of-Load Synchronous Buck Converter for MB/NB/UMPC/VGA
- Networking DC-DC Power System
- LCD/LED back light

TO252 Pin Configuration


N-Ch 60V Fast Switching MOSFETs
Electrical Characteristics ($T_J=25\text{ }^\circ\text{C}$, unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|------------------------------|--|--|------|-------|-----------|----------------------|
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS}=0V, I_D=250\mu A$ | 60 | --- | --- | V |
| $\Delta BV_{DSS}/\Delta T_J$ | BV_{DSS} Temperature Coefficient | Reference to 25°C , $I_D=1\text{mA}$ | --- | 0.057 | --- | V/ $^\circ\text{C}$ |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance ² | $V_{GS}=10V, I_D=20A$ | --- | 14 | 18 | m Ω |
| | | $V_{GS}=4.5V, I_D=10A$ | --- | 16 | 20 | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}=V_{DS}, I_D=250\mu A$ | 1.2 | --- | 2.5 | V |
| $\Delta V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | -5.68 | --- | mV/ $^\circ\text{C}$ |
| I_{DSS} | Drain-Source Leakage Current | $V_{DS}=48V, V_{GS}=0V, T_J=25^\circ\text{C}$ | --- | --- | 1 | μA |
| | | $V_{DS}=48V, V_{GS}=0V, T_J=55^\circ\text{C}$ | --- | --- | 5 | |
| I_{GSS} | Gate-Source Leakage Current | $V_{GS}=\pm 20V, V_{DS}=0V$ | --- | --- | ± 100 | nA |
| g_{fs} | Forward Transconductance | $V_{DS}=5V, I_D=15A$ | --- | 45 | --- | S |
| R_g | Gate Resistance | $V_{DS}=0V, V_{GS}=0V, f=1\text{MHz}$ | --- | 1.7 | 3.4 | Ω |
| Q_g | Total Gate Charge (4.5V) | $V_{DS}=48V, V_{GS}=4.5V, I_D=15A$ | --- | 19.3 | 27 | nC |
| Q_{gs} | Gate-Source Charge | | --- | 7.1 | 10 | |
| Q_{gd} | Gate-Drain Charge | | --- | 7.6 | 10.6 | |
| $T_{d(on)}$ | Turn-On Delay Time | $V_{DD}=30V, V_{GS}=10V, R_G=3.3\Omega, I_D=15A$ | --- | 7.2 | 14.4 | ns |
| T_r | Rise Time | | --- | 50 | 90 | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 36.4 | 73 | |
| T_f | Fall Time | | --- | 7.6 | 15.2 | |
| C_{iss} | Input Capacitance | $V_{DS}=15V, V_{GS}=0V, f=1\text{MHz}$ | --- | 2423 | 3392 | pF |
| C_{oss} | Output Capacitance | | --- | 145 | 203 | |
| C_{riss} | Reverse Transfer Capacitance | | --- | 97 | 136 | |

Guaranteed Avalanche Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|--------|--|--|------|------|------|------|
| EAS | Single Pulse Avalanche Energy ⁵ | $V_{DD}=25V, L=0.1\text{mH}, I_{AS}=15A$ | 19 | --- | --- | mJ |

Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|----------|--|---|------|------|------|------|
| I_S | Continuous Source Current ^{1,6} | $V_G=V_D=0V$, Force Current | --- | --- | 35 | A |
| I_{SM} | Pulsed Source Current ^{2,6} | | --- | --- | 80 | A |
| V_{SD} | Diode Forward Voltage ² | $V_{GS}=0V, I_S=A, T_J=25^\circ\text{C}$ | --- | --- | 1 | V |
| t_{rr} | Reverse Recovery Time | $I_F=15A, di/dt=100A/\mu s, T_J=25^\circ\text{C}$ | --- | 16.3 | --- | nS |
| Q_{rr} | Reverse Recovery Charge | | --- | 11 | --- | nC |

Note :

- The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- The data tested by pulsed, pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
- The EAS data shows Max. rating. The test condition is $V_{DD}=25V, V_{GS}=10V, L=0.1\text{mH}, I_{AS}=28A$
- The power dissipation is limited by 150°C junction temperature
- The Min. value is 100% EAS tested guarantee.
- 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

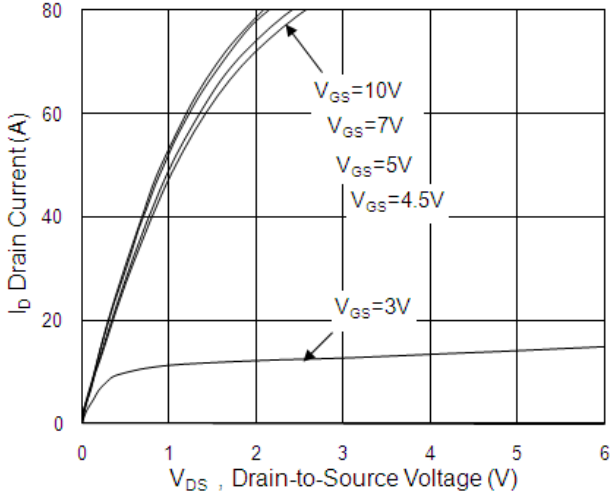


Fig.1 Typical Output Characteristics

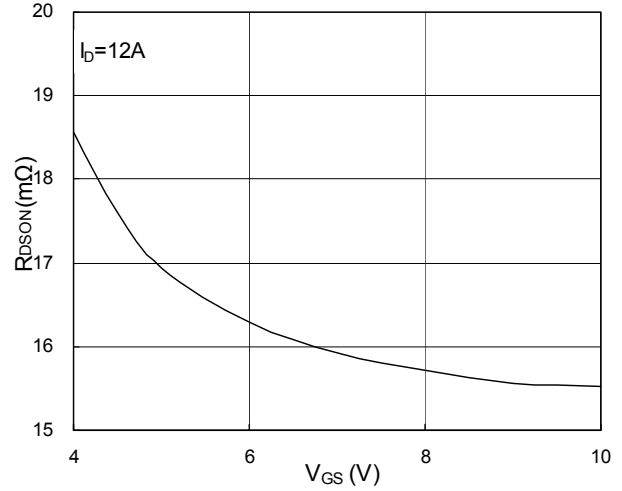


Fig.2 On-Resistance v.s Gate-Source

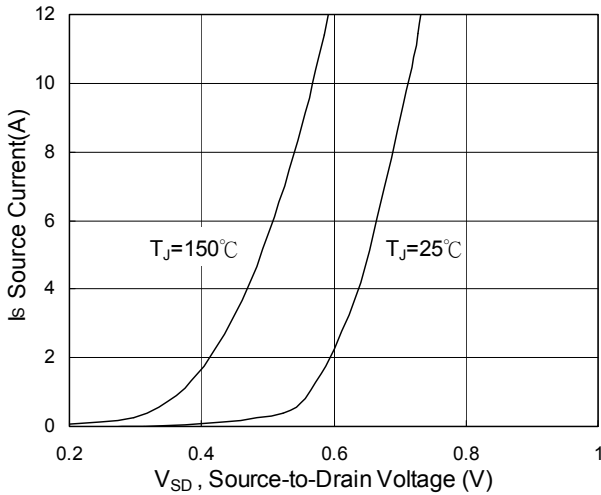


Fig.3 Forward Characteristics of Reverse

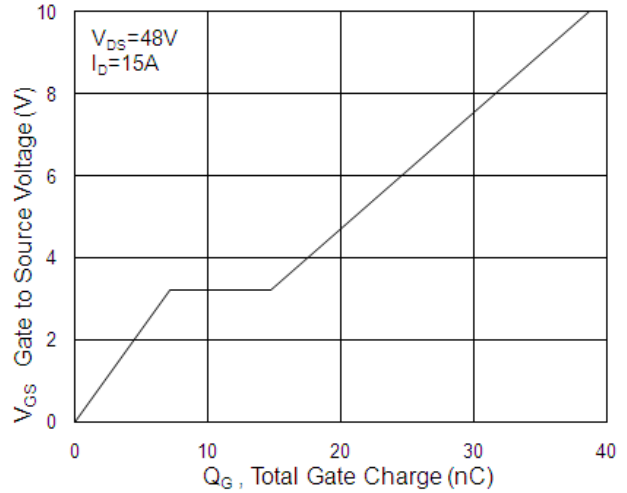


Fig.4 Gate-Charge Characteristics

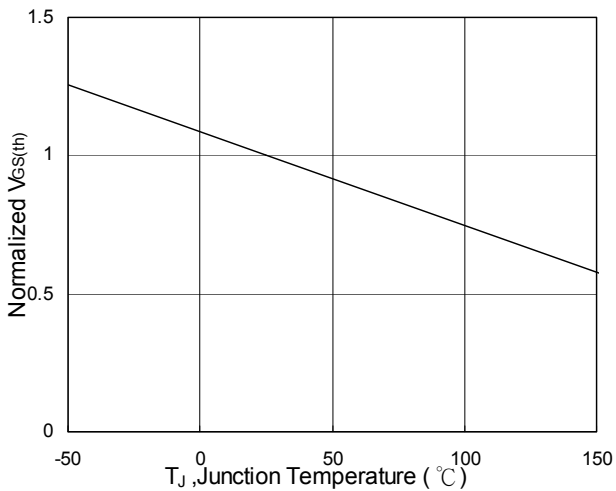


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

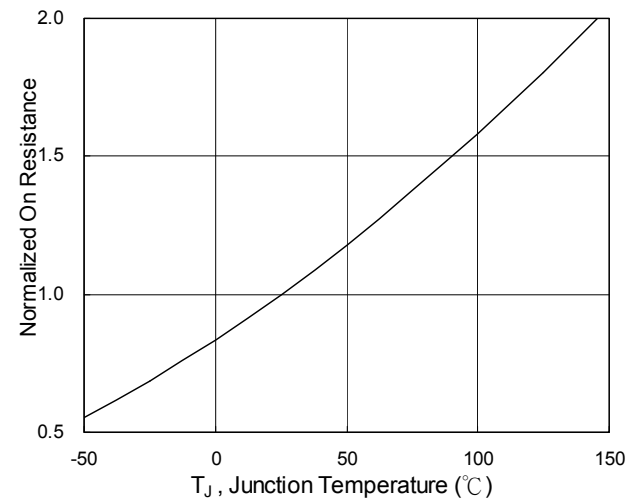


Fig.6 Normalized $R_{DS(on)}$ v.s T_J

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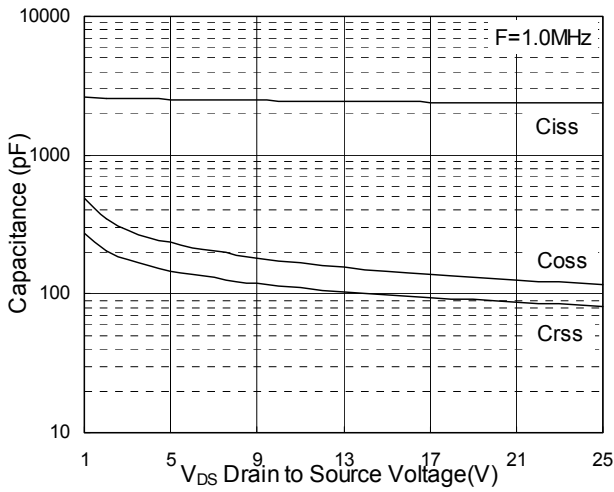


Fig.7 Capacitance

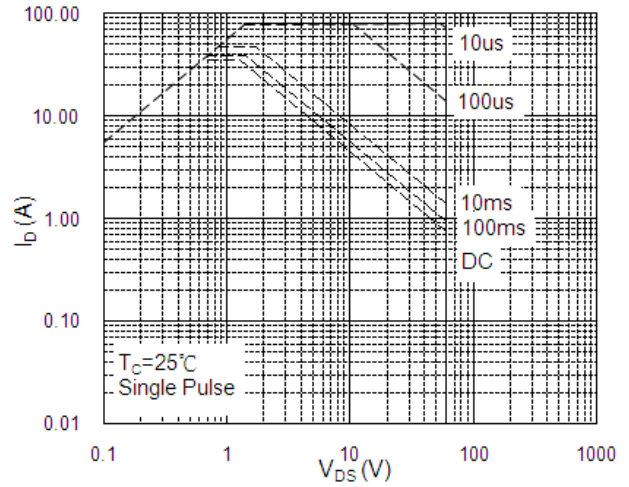


Fig.8 Safe Operating Area

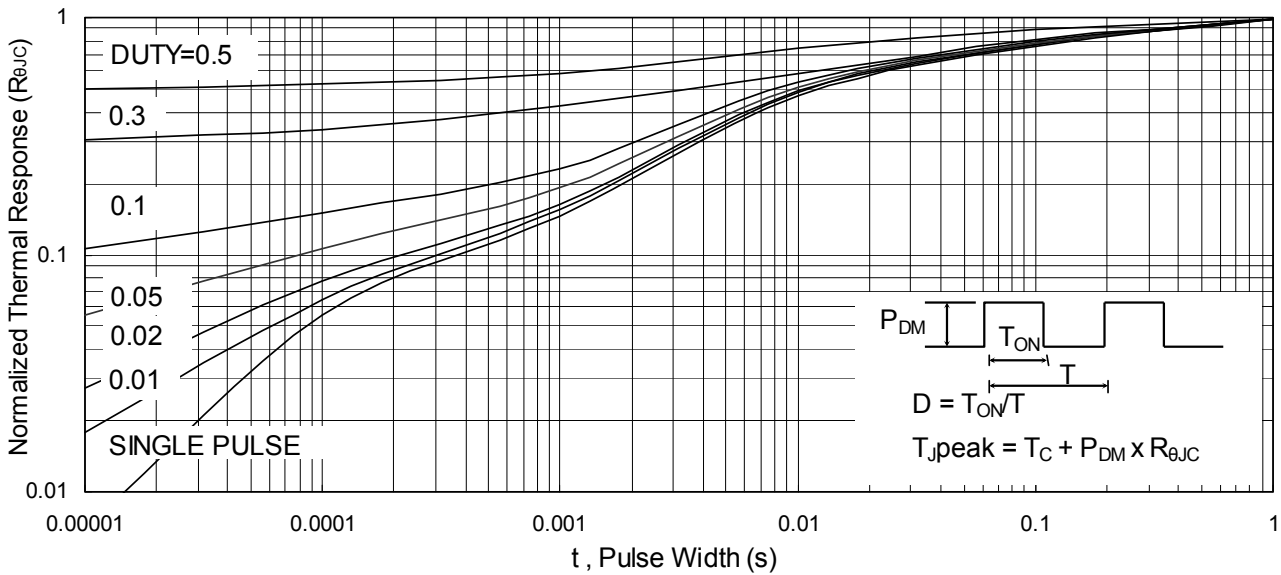


Fig.9 Normalized Maximum Transient Thermal Impedance



Fig.10 Switching Time Waveform

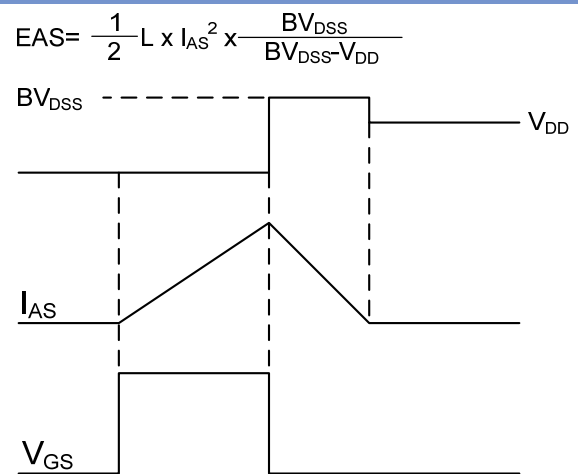


Fig.11 Unclamped Inductive Switching Waveform