# AT06L47I

## 60V N-Channel MOSFET

## Features

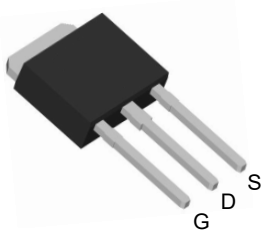
- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- 100% EAS Guaranteed
- Green Device Available

## Product Summary

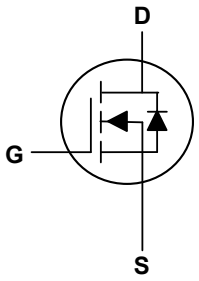
| | | |
|---|---|---|
| $V_{DS}$ | 60 | V |
| $I_D$ | 47 | A |
| $R_{DS(ON)}$ (at $V_{GS}$=10V) | 12 | mΩ |

## Applications

- High Frequency Point-of-Load Synchronous Buck Converter
- Networking DC-DC Power System
- Load Switch




TO-251A Top View




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

| Parameter | Symbol | Rating | Units |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 60 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Continuous Drain Current, VGS @ 10V[1] | $I_D$@$T_C$=25℃ | 47 | A |
| Continuous Drain Current, VGS @ 10V[1] | $I_D$@$T_C$=100℃ | 30 | A |
| Continuous Drain Current, VGS @ 10V[1] | $I_D$@$T_A$=25℃ | 9.2 | A |
| Continuous Drain Current, VGS @ 10V[1] | $I_D$@$T_A$=70℃ | 7.5 | A |
| Pulsed Drain Current[2] | $I_{DM}$ | 100 | A |
| Single Pulse Avalanche Energy[3] | EAS | 72.2 | mJ |
| Avalanche Current | $I_{AS}$ | 38 | A |
| Total Power Dissipation[4] | $P_D$@$T_C$=25℃ | 52 | W |
| Total Power Dissipation[4] | $P_D$@$T_A$=25℃ | 2 | W |
| Storage Temperature Range | $T_{STG}$ | -55 to 150 | ℃ |
| Operating Junction Temperature Range | $T_J$ | -55 to 150 | ℃ |

## Thermal Characteristics

| Parameter | Symbol | Typ | Max | Unit |
|---|---|---|---|---|
| Thermal Resistance Junction-Ambient[1] | $R_{\theta JA}$ | --- | 62 | ℃/W |
| Thermal Resistance Junction-Case[1] | $R_{\theta JC}$ | --- | 2.4 | ℃/W |

## Electrical Characteristics ($T_J$=25℃, unless otherwise noted)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V , $I_D$=250uA | 60 | --- | --- | V |
| $BV_{DSS}$ Temperature Coefficient | $\triangle BV_{DSS}/\triangle T_J$ | Reference to 25℃ , $I_D$=1mA | --- | 0.052 | --- | V/℃ |
| Static Drain-Source On-Resistance[2] | $R_{DS(ON)}$ | $V_{GS}$=10V , $I_D$=30A | --- | 9 | 12 | mΩ |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{GS}$=$V_{DS}$ , $I_D$ =250uA | 2 | --- | 5 | V |
| $V_{GS(th)}$ Temperature Coefficient | $\triangle V_{GS(th)}$ | | --- | -5.76 | --- | mV/℃ |
| Drain-Source Leakage Current | $I_{DSS}$ | $V_{DS}$=48V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | 1 | uA |
| | | $V_{DS}$=48V , $V_{GS}$=0V , $T_J$=55℃ | --- | --- | 5 | |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| Forward Transconductance | gfs | $V_{DS}$=5V , $I_D$=30A | --- | 42 | --- | S |
| Gate Resistance | $R_g$ | $V_{DS}$=0V , $V_{GS}$=0V , f=1MHz | --- | --- | 3 | Ω |
| Total Gate Charge | $Q_g$ | $V_{DS}$=48V , $V_{GS}$=10V , $I_D$=15A | --- | 33.7 | --- | nC |
| Gate-Source Charge | $Q_{gs}$ | | --- | 10.6 | --- | |
| Gate-Drain Charge | $Q_{gd}$ | | --- | 9.9 | --- | |
| Turn-On Delay Time | $T_{d(on)}$ | $V_{DD}$=30V , $V_{GS}$=10V , $R_G$=3.3Ω, $I_D$=15A | --- | 10.6 | --- | ns |
| Rise Time | $T_r$ | | --- | 9.1 | --- | |
| Turn-Off Delay Time | $T_{d(off)}$ | | --- | 64 | --- | |
| Fall Time | $T_f$ | | --- | 4.5 | --- | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=15V , $V_{GS}$=0V , f=1MHz | --- | 2186 | --- | pF |
| Output Capacitance | $C_{oss}$ | | --- | 260 | --- | |
| Reverse Transfer Capacitance | $C_{rss}$ | | --- | 167 | --- | |

## Drain-Source Diode Characteristics

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Continuous Source Current[1,5] | $I_S$ | $V_G$=$V_D$=0V , Force Current | --- | --- | 47 | A |
| Pulsed Source Current[2,5] | $I_{SM}$ | | --- | --- | 100 | A |
| Diode Forward Voltage[2] | $V_{SD}$ | $V_{GS}$=0V , $I_S$=1A , $T_J$=25℃ | --- | --- | 1.2 | V |
| Reverse Recovery Time | $t_{rr}$ | $I_F$=15A ,di/dt=100A/μs, $T_J$=25℃ | --- | 18 | --- | nS |
| Reverse Recovery Charge | $Q_{rr}$ | | --- | 14 | --- | nC |

**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

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

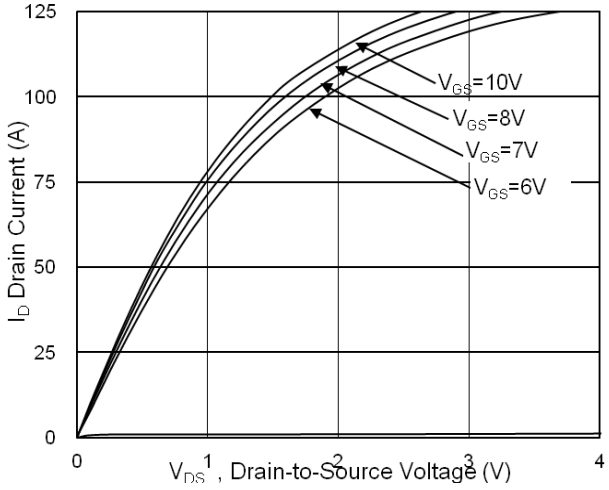



**Fig.1 Typical Output Characteristics**

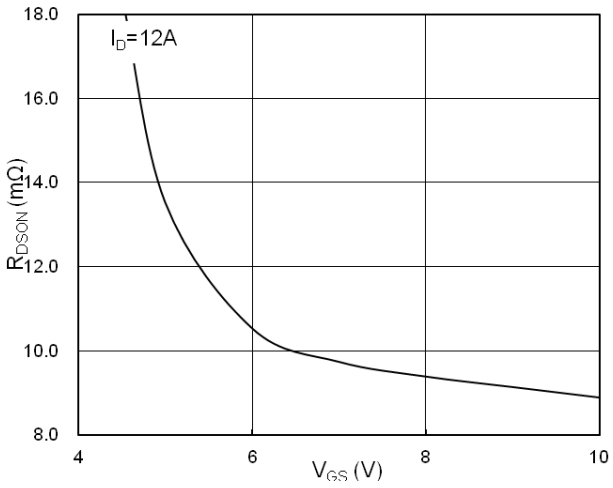



**Fig.2 On-Resistance v.s Gate-Source**

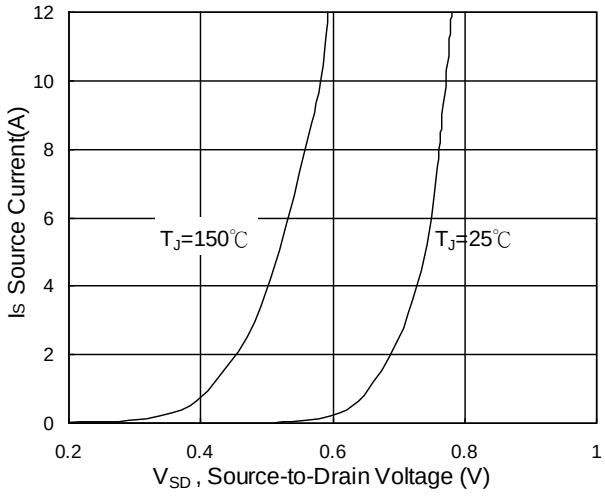



**Fig.3 Forward Characteristics of Reverse**

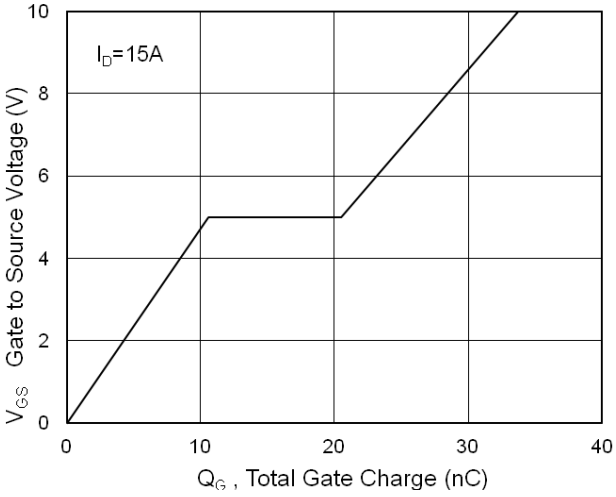



**Fig.4 Gate-Charge Characteristics**

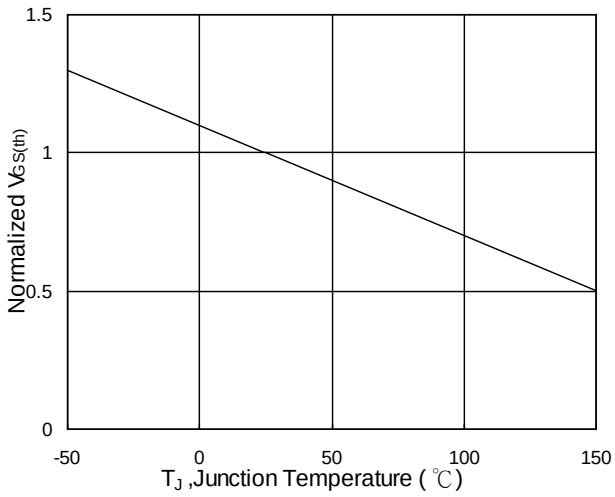



**Fig.5 Normalized $V_{GS(th)}$ vs. $T_J$**

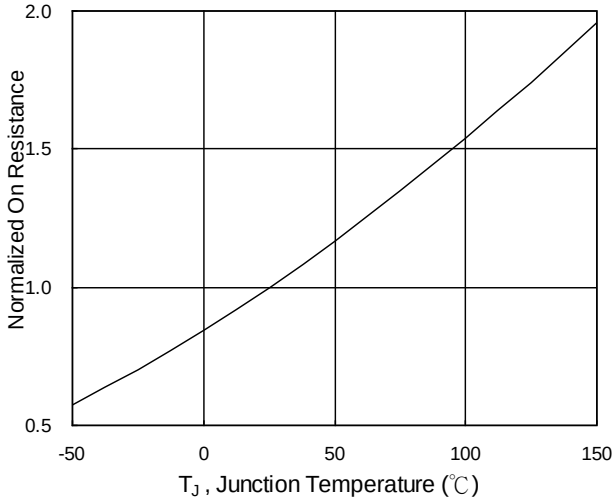



**Fig.6 Normalized $R_{DSON}$ vs. $T_J$**

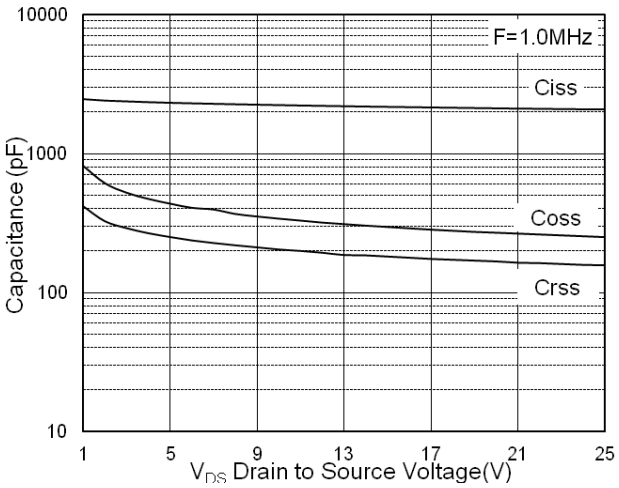



Fig.7 Capacitance

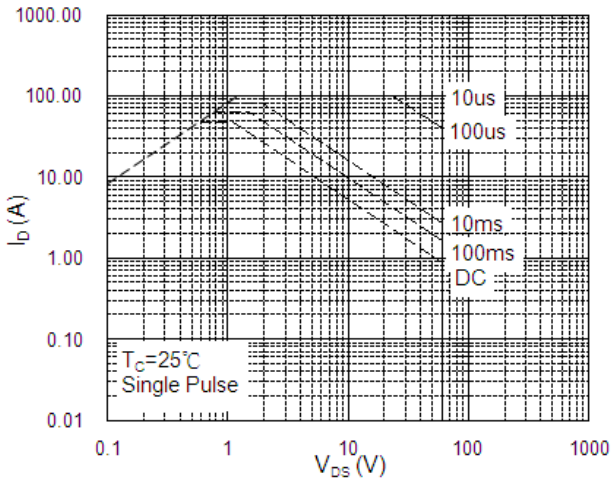



Fig.8 Safe Operating Area

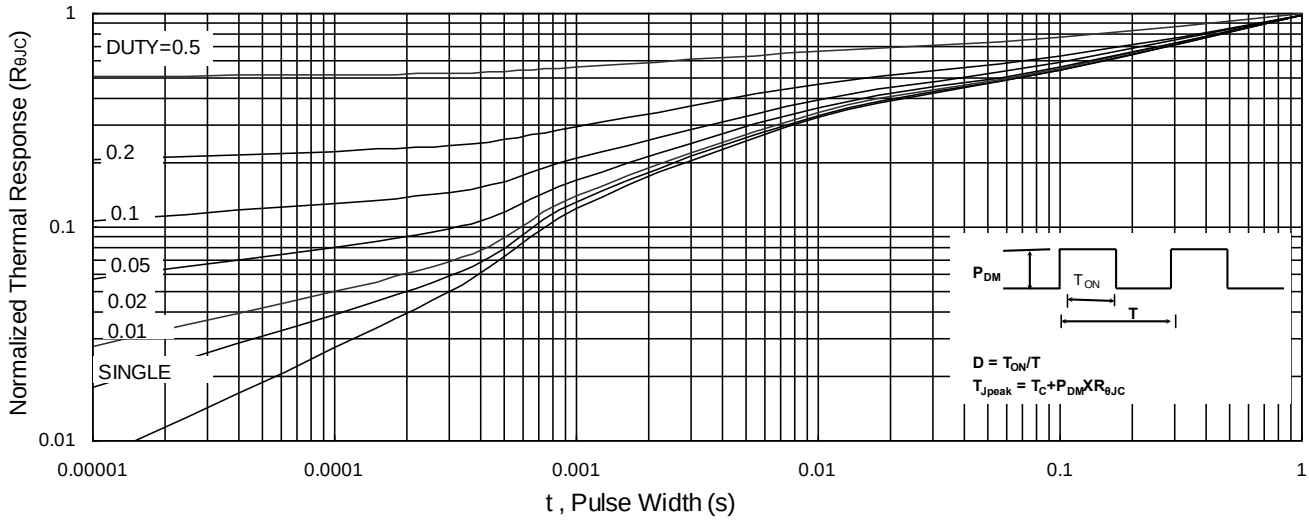



Fig.9 Normalized Maximum Transient Thermal Impedance

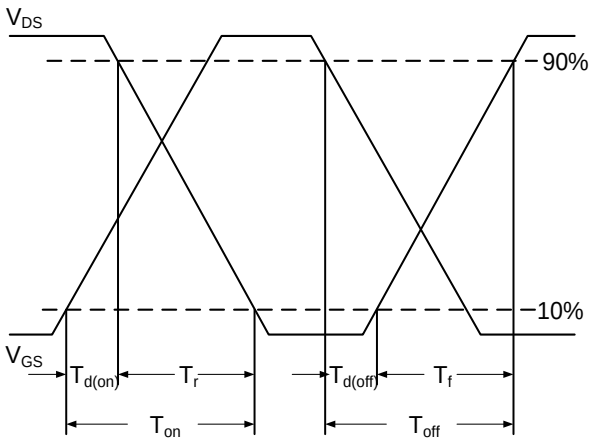



Fig.10 Switching Time Waveform

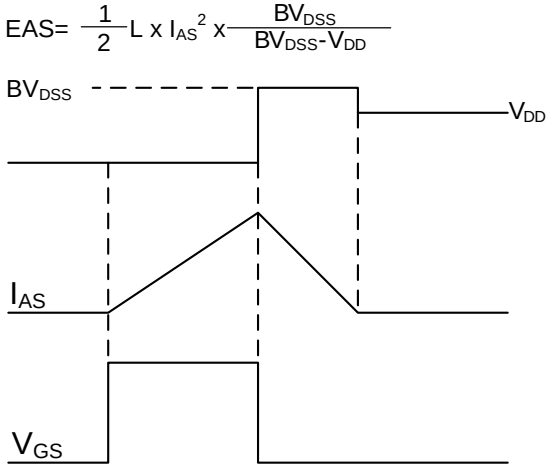
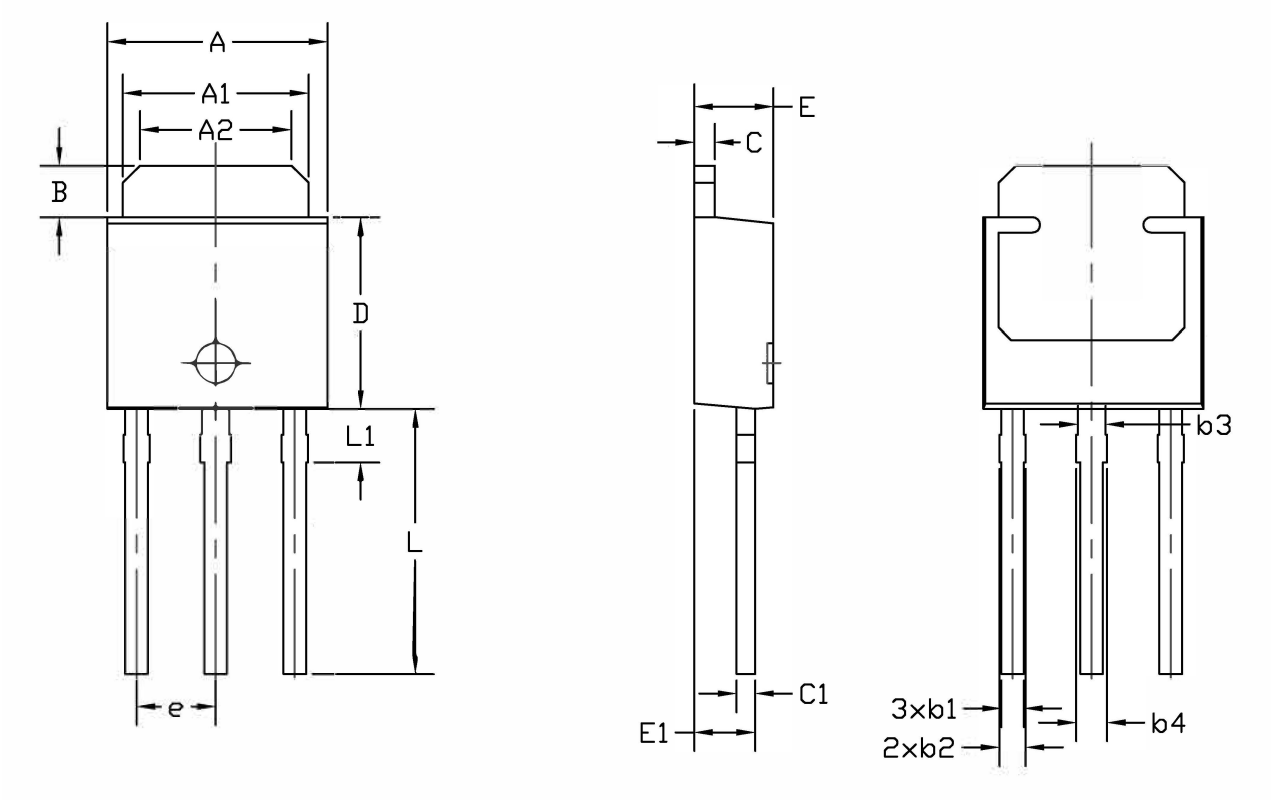



Fig.11 Unclamped Inductive Switching Waveform

## TO-251A Package Outline Dimensions




| Symbol | Dimensions (unit:mm) | | | Symbol | Dimensions (unit:mm) | | |
|---|---|---|---|---|---|---|---|
| | Min | Typ | Max | | Min | Typ | Max |
| **A** | 6.35 | 6.55 | 6.65 | **C** | 0.45 | 0.55 | 0.65 |
| **A1** | 5.20 | 5.35 | 5.50 | **C1** | 0.45 | 0.55 | 0.65 |
| **A2** | 4.20 | 4.35 | 4.50 | **D** | 5.40 | 5.55 | 5.70 |
| **B** | 1.35 | 1.50 | 1.65 | **E** | 2.20 | 2.30 | 2.40 |
| **b1** | 0.55 | 0.65 | 0.75 | **e** | 2.30 REF | | |
| **b2** | 0.60 | 0.70 | 0.85 | **E1** | 1.70 | 1.77 | 1.82 |
| **b3** | 0.80 REF | | | **L** | 7.40 | 7.70 | 8.00 |
| **b4** | 0.90 REF | | | **L1** | 1.55 REF | | |