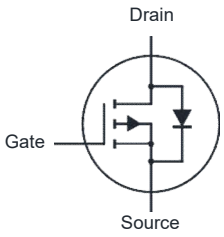
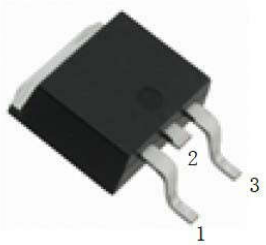
# WTR06P600L-AH

## P-Channel Enhancement Mode MOSFET




1.Gate 2.Drain 3.Source

TO-252 Plastic Package

### Features

- AEC-Q101 Qualified
- Halogen and Antimony Free(HAF), RoHS compliant

### Applications

- Portable appliances
- Battery management

### Key Parameters

| Parameter | Value | Unit |
|---|---|---|
| $-BV_{DSS}$ | 60 | V |
| $R_{DS(ON)}$ Max | 60 @ $-V_{GS}$ = 10 V | mΩ |
| | 75 @ $-V_{GS}$ = 4.5 V | mΩ |
| $-V_{GS(th)}$ typ | 1.7 | V |
| $Q_g$ typ | 24 @ $-V_{GS}$ = 10 V | nC |

### Absolute Maximum Ratings (at $T_a$ = 25℃ unless otherwise specified)

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain-Source Voltage | $-V_{DS}$ | 60 | V |
| Gate-Source Voltage | $V_{GS}$ | ± 20 | V |
| Drain Current $T_c$ = 25℃<br>$T_c$ = 100℃ | $-I_D$ | 18<br>11 | A |
| Peak Drain Current, Pulsed [1] | $-I_{DM}$ | 50 | A |
| Avalanche Current | $-I_{AS}$ | 21 | A |
| Single Pulse Avalanche Energy [2] | $E_{AS}$ | 22 | mJ |
| Power Dissipation $T_c$ = 25℃<br>$T_c$ = 100℃ | $P_D$ | 41.6<br>16.6 | W |
| Operating Junction and Storage Temperature Range | $T_J$,$T_{stg}$ | - 55 to + 150 | ℃ |

### Thermal Characteristics

| Parameter | Symbol | Max. | Unit |
|---|---|---|---|
| Thermal Resistance from Junction to Case | $R_{\theta JC}$ | 3 | ℃/W |
| Thermal Resistance from Junction to Ambient [3] | $R_{\theta JA}$ | 40 | ℃/W |

[1] Pulse Test: Pulse Width ≤ 100 μs, Duty Cycle ≤ 2%, Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$ = 150°C.

[2] Limited by $T_{J(MAX)}$, starting $T_J$ = 25 °C, L = 0.1 mH, $R_g$ = 25 Ω, $-I_{AS}$ = 21 A, $V_{GS}$ = 10 V.

[3] Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate in still air.



Dated: 23/11/2020 Rev: 01

**Characteristics at $T_a$ = 25℃ unless otherwise specified**

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| **STATIC PARAMETERS** | | | | | |
| Drain-Source Breakdown Voltage<br>at $-I_D$ = 250 µA | $-V_{(BR)DSS}$ | 60 | - | - | V |
| Drain-Source On-State Current<br>at $-V_{DS}$ = 60 V | $-I_{DSS}$ | - | - | 1 | µA |
| Gate-Source Leakage Current<br>at $V_{GS}$ = ± 20 V | $I_{GSS}$ | - | - | ± 100 | nA |
| Gate-Source Threshold Voltage<br>at $V_{DS}$ = $V_{GS}$, $-I_D$ = 250 µA | $-V_{GS(th)}$ | 1.3 | - | 2.5 | V |
| Drain-Source On-State Resistance<br>at $-V_{GS}$ = 10 V, $-I_D$ = 18 A<br>at $-V_{GS}$ = 4.5 V, $-I_D$ = 10 A | $R_{DS(ON)}$ | -<br>- | 52<br>- | 60<br>75 | mΩ |
| **DYNAMIC PARAMETERS** | | | | | |
| Gate resistance<br>at $V_{DS}$ = 0 V, f = 1 MHz | $R_g$ | - | 19 | - | Ω |
| Forward Transconductance<br>at $-V_{DS}$ = 5 V, $-I_D$ = 18 A | $g_{fs}$ | - | 25 | - | S |
| Input Capacitance<br>at $V_{GS}$ = 0 V, $-V_{DS}$ = 25 V, f = 1 MHz | $C_{iss}$ | - | 1479 | - | pF |
| Output Capacitance<br>at $V_{GS}$ = 0 V, $-V_{DS}$ = 25 V, f = 1 MHz | $C_{oss}$ | - | 70 | - | pF |
| Reverse Transfer Capacitance<br>at $V_{GS}$ = 0 V, $-V_{DS}$ = 25 V, f = 1 MHz | $C_{rss}$ | - | 36 | - | pF |
| Total Gate Charge<br>at $-V_{DS}$ = 30 V, $-I_D$ = 5.7 A, $-V_{GS}$ = 10 V<br>at $-V_{DS}$ = 30 V, $-I_D$ = 5.7 A, $-V_{GS}$ = 4.5 V | $Q_g$ | -<br>- | 24<br>11 | -<br>- | nC |
| Gate-Source Charge<br>at $-V_{DS}$ = 30 V, $-I_D$ = 5.7 A, $-V_{GS}$ = 10 V | $Q_{gs}$ | - | 5 | - | nC |
| Gate-Drain Charge<br>at $-V_{DS}$ = 30 V, $-I_D$ = 5.7 A, $-V_{GS}$ = 10 V | $Q_{gd}$ | - | 3 | - | nC |
| Turn-On Delay Time<br>at $-V_{DS}$ = 30 V, $-I_D$ = 5.7 A, $-V_{GS}$ = 10 V, $R_g$ = 1 Ω | $t_{d(on)}$ | - | 6 | - | nS |
| Turn-On Rise Time<br>at $-V_{DS}$ = 30 V, $-I_D$ = 5.7 A, $-V_{GS}$ = 10 V, $R_g$ = 1 Ω | $t_r$ | - | 12 | - | nS |
| Turn-Off Delay Time<br>at $-V_{DS}$ = 30 V, $-I_D$ = 5.7 A, $-V_{GS}$ = 10 V, $R_g$ = 1 Ω | $t_{d(off)}$ | - | 43 | - | nS |
| Turn-Off Fall Time<br>at $-V_{DS}$ = 30 V, $-I_D$ = 5.7 A, $-V_{GS}$ = 10 V, $R_g$ = 1 Ω | $t_f$ | - | 13 | - | nS |
| **Body-Diode PARAMETERS** | | | | | |
| Drain-Source Diode Forward Voltage<br>at $-I_S$ = 1 A, $V_{GS}$ = 0 V | $-V_{SD}$ | - | - | 1.2 | V |
| Body-Diode Continuous Current | $-I_S$ | - | - | 18 | A |
| Body-Diode Continuous Current, Pulsed | $-I_{SM}$ | - | - | 50 | A |
| Body Diode Reverse Recovery Time<br>at $-I_S$ = 5.7 A, di/dt = 100 A / µs | $t_{rr}$ | - | 14 | - | nS |
| Body Diode Reverse Recovery Charge<br>at $-I_S$ = 5.7 A, di/dt = 100 A / µs | $Q_{rr}$ | - | 11 | - | nC |

## Electrical Characteristics Curves

Fig. 1 Typical Output Characteristic

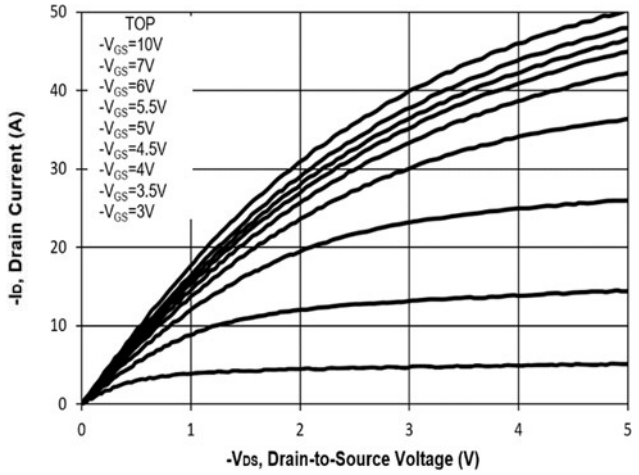



Fig. 2 Typical Transfer Characteristic

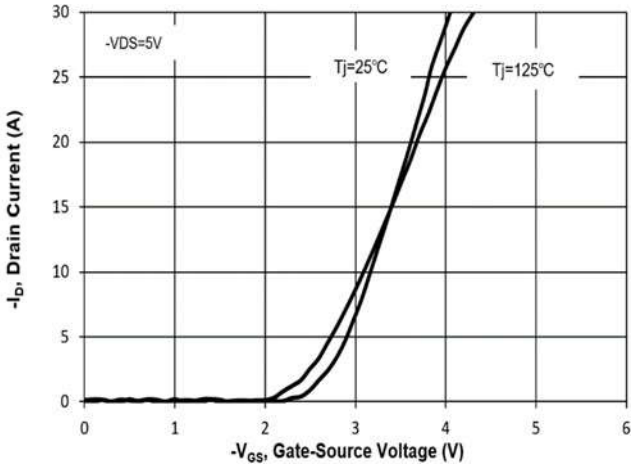



Fig. 3 on-Resistance vs. Drain Current

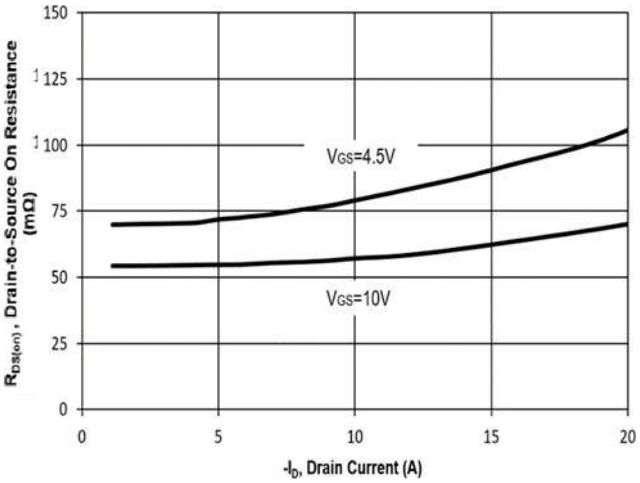



Fig. 4 on-Resistance vs. Gate Voltage

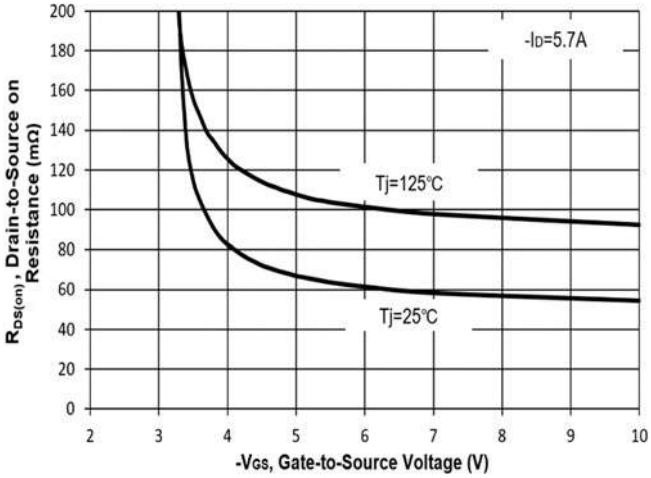



Fig. 5 on-Resistance vs.$T_j$

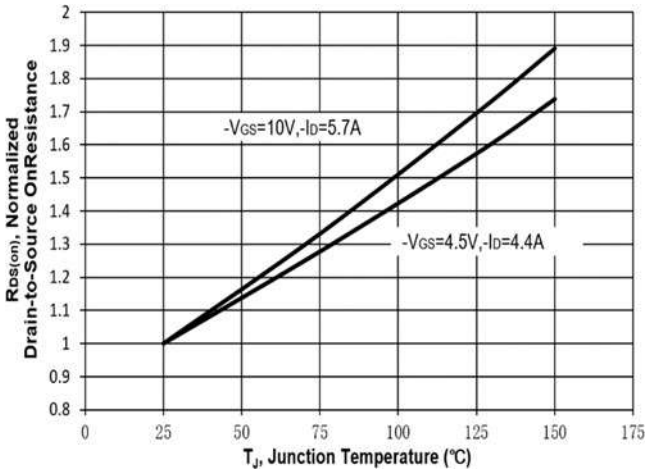
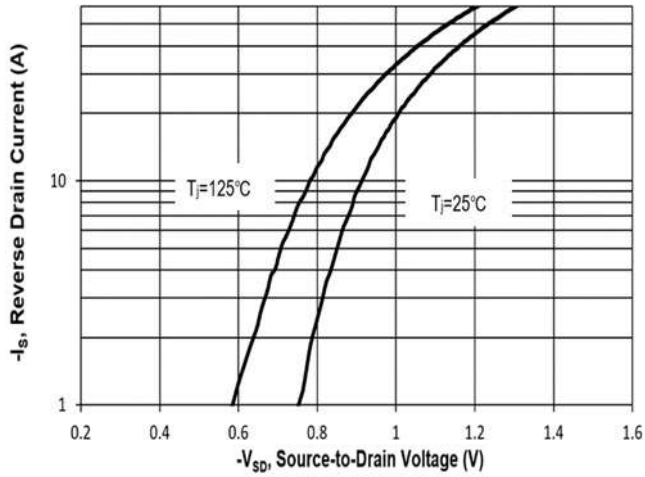



Fig. 6 Typical Forward Characteristic



## Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

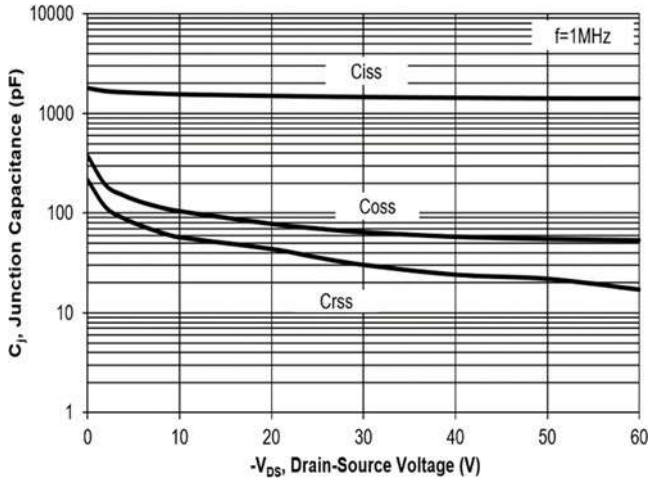



Fig. 8 Drain-Source Leakage Current vs. $T_j$

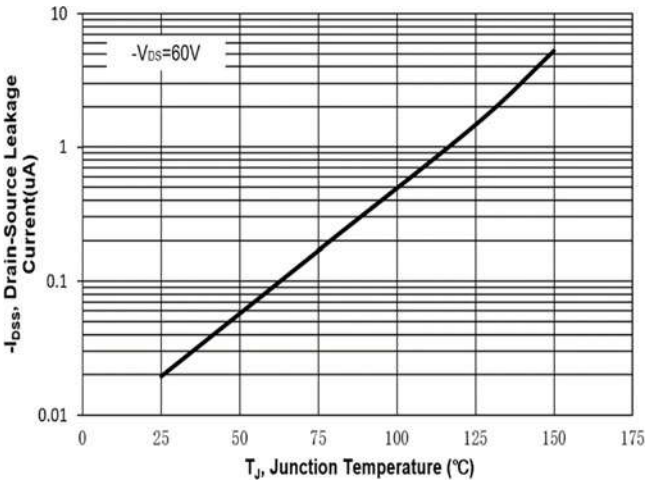



Fig. 9 $V_{(BR)DSS}$ vs. Junction Temperature

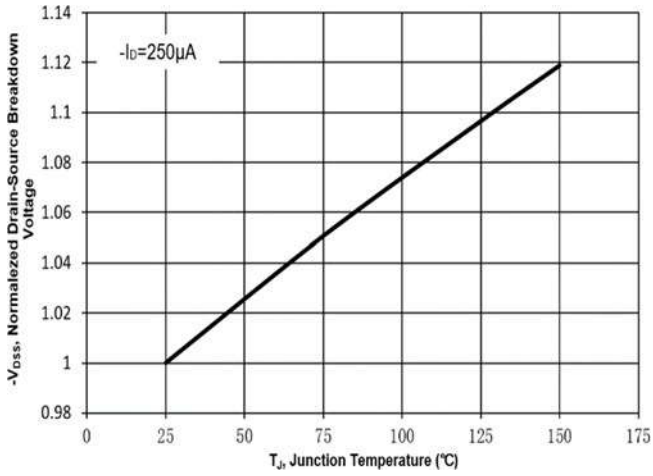



Fig. 10 Gate Threshold Variation vs. $T_j$

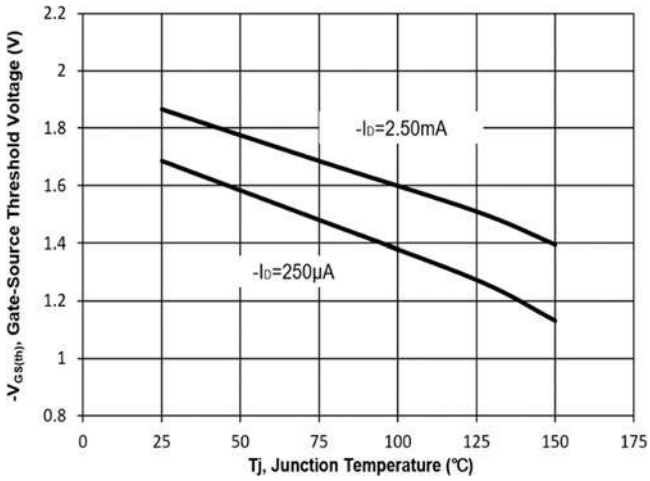



Fig. 11 Gate Charge

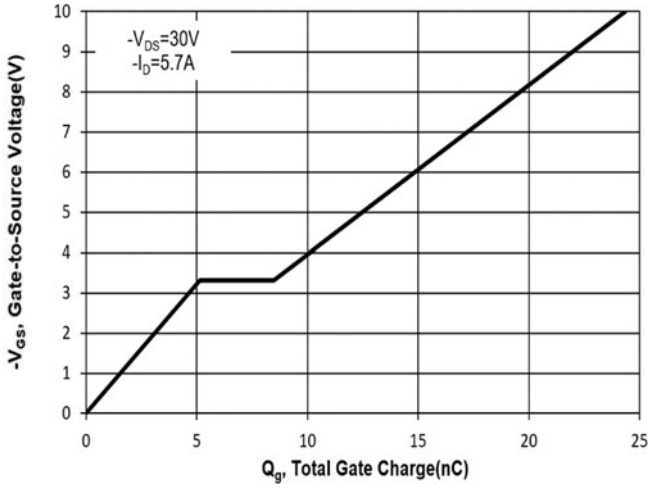
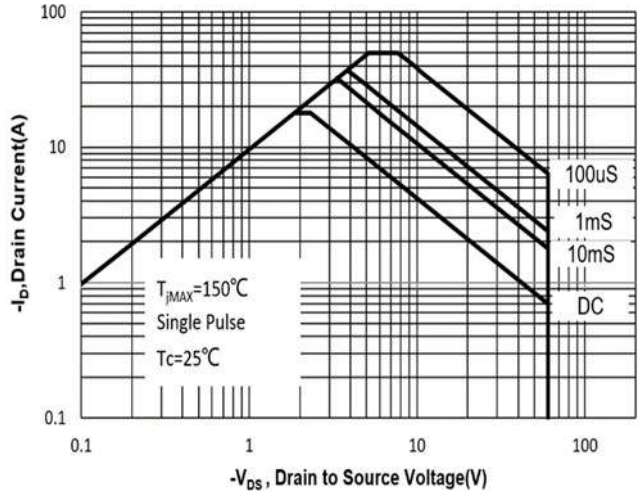



Fig. 12 Safe Operation Area



## Electrical Characteristics Curves

Fig. 13 Normalized Maximum Transient Thermal Impedance($z_{\Theta JC}$)

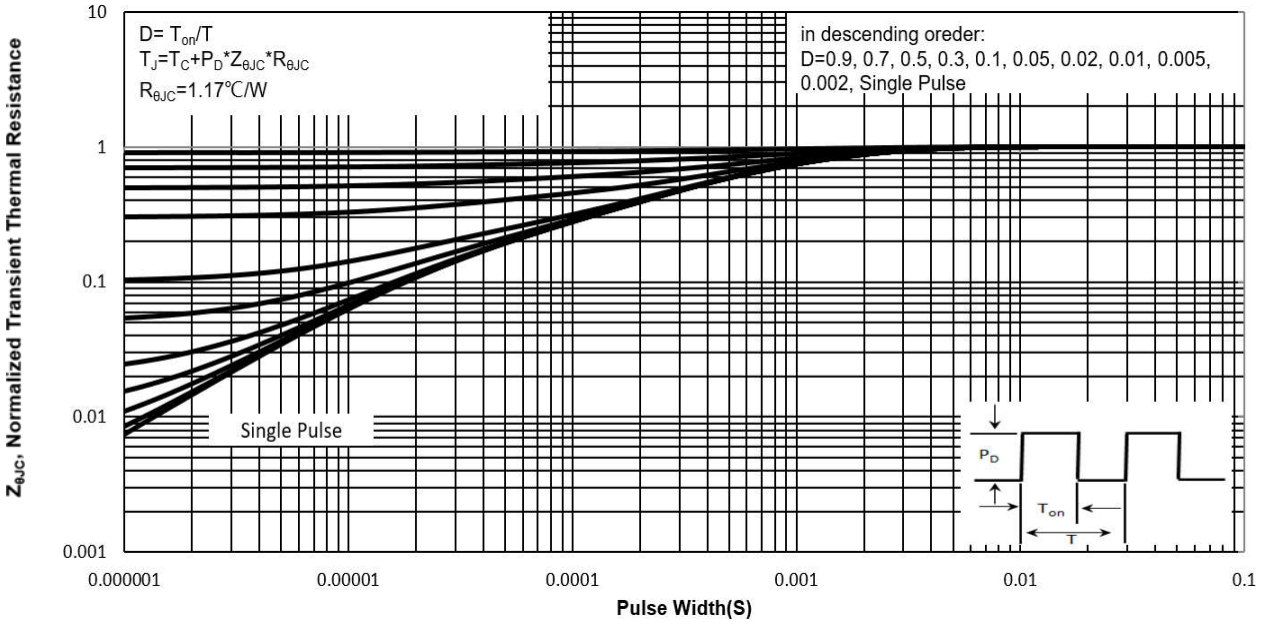
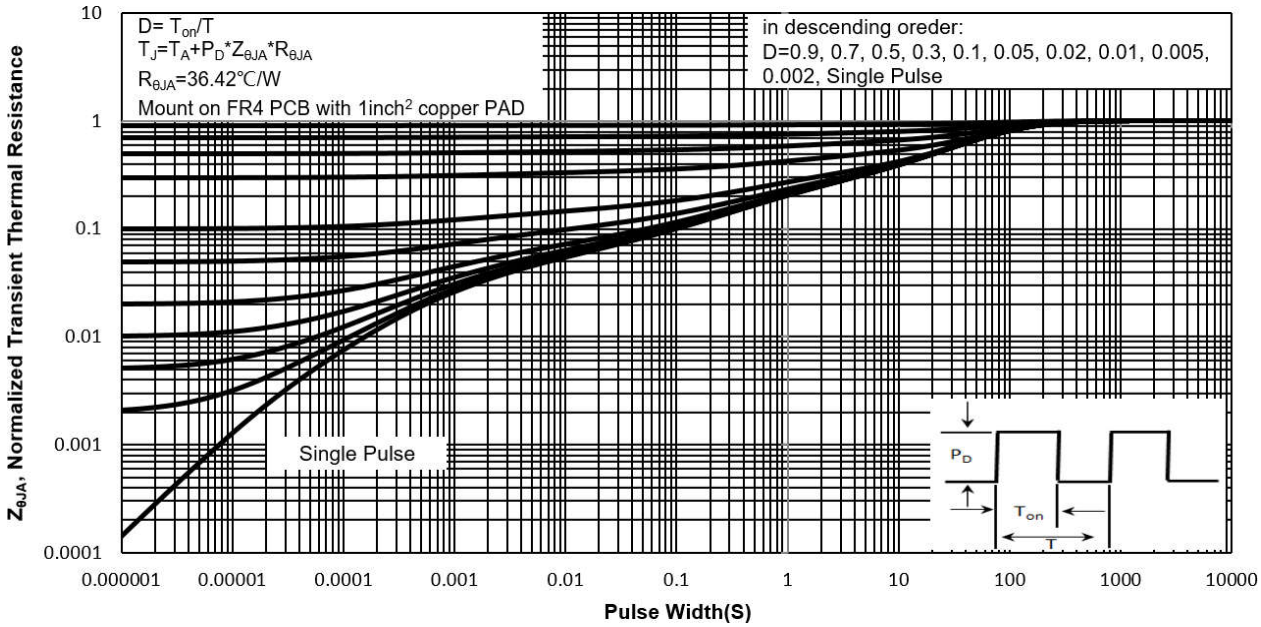



Fig. 14 Normalized Maximum Transient Thermal Impedance($z_{\Theta JA}$)



**Test Circuits**

Fig.1-1 Switching times test circuit

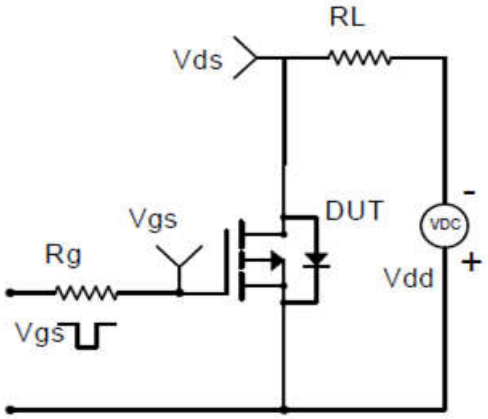



Fig.1-2 Switching Waveform

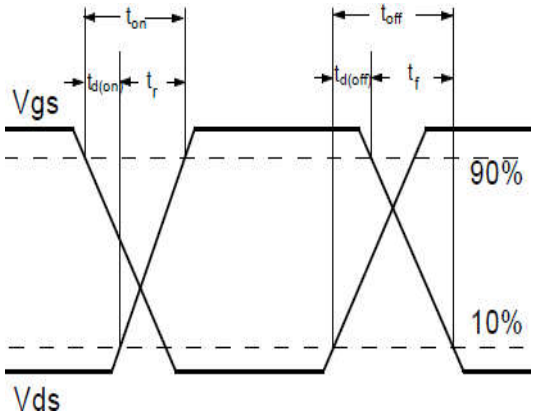



Fig.2-1 Gate charge test circuit

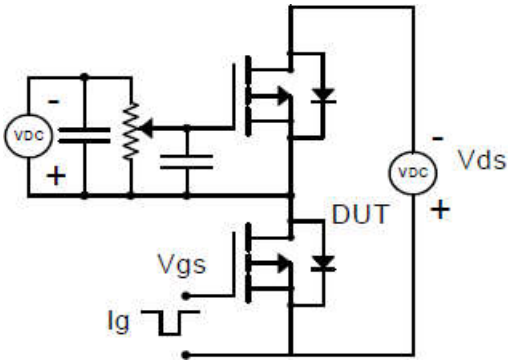



Fig.2-2 Gate charge waveform

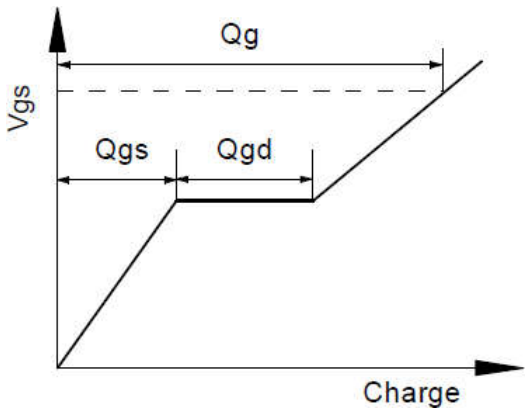



Fig.3-1 Avalanche test circuit

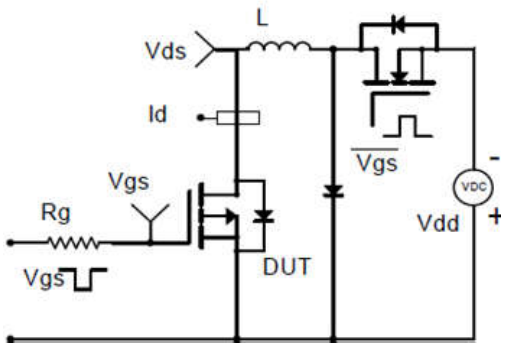
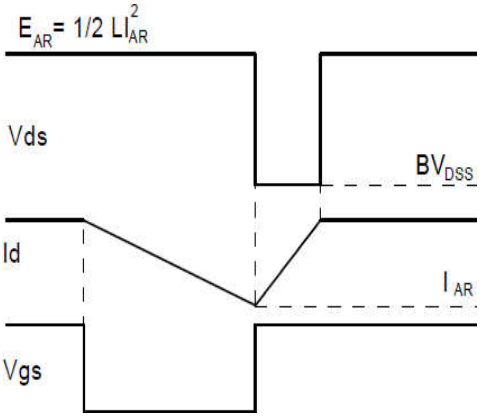
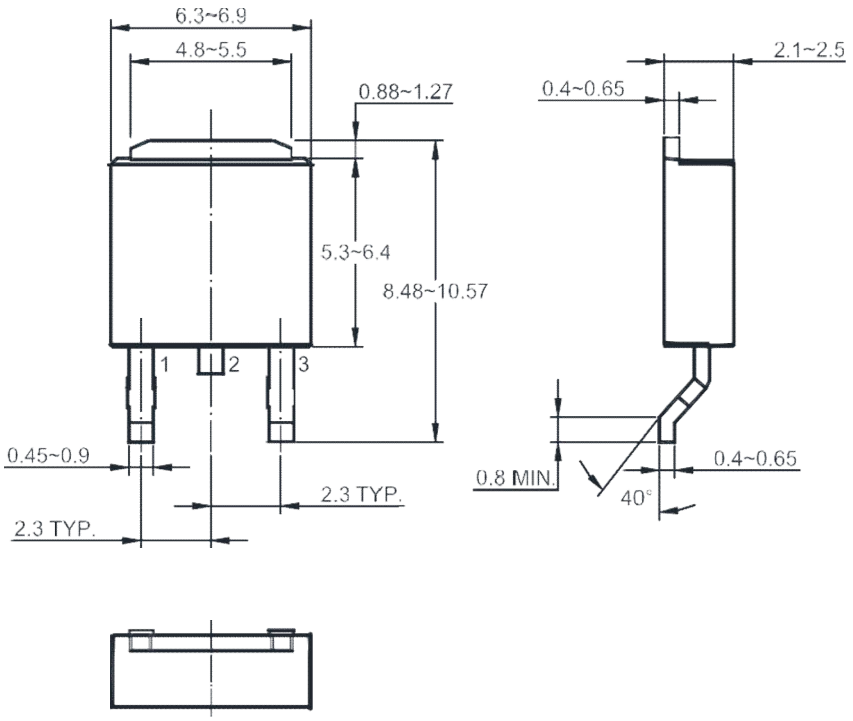


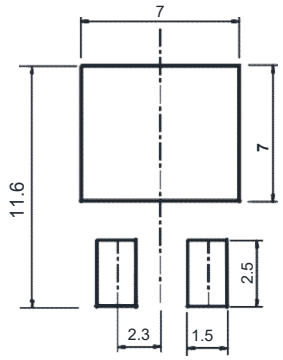

Fig.3-2 Avalanche waveform



## Package Outline Dimensions (Units: mm) TO-252




## Recommended Soldering Footprint




### Packing information

| Package | Tape Width (mm) | Pitch | | Reel Size | | Per Reel Packing Quantity |
|---|---|---|---|---|---|---|
| | | mm | inch | mm | inch | |
| TO-252 | 12 | 8 ± 0.1 | 0.315 ± 0.004 | 330 | 13 | 2,500 |

### Marking information

" TR06P600L " = PartNo.
" ****** " = Date Code Marking
Font type: Arial

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