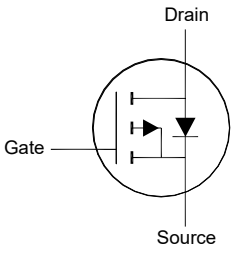
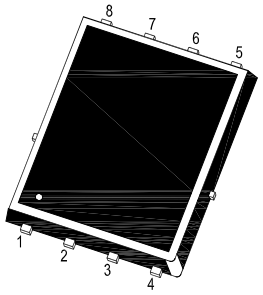
# WTM503P260L-HAF

## P-Channel Enhancement Mode MOSFET

### Features

• Halogen and Antimony Free(HAF), RoHS compliant




1. Source 2. Source 3. Source 4. Gate
5. Drain 6. Drain 7. Drain 8. Drain
DFN5060 Plastic Package

### Applications

• Load Switches
• Battery Switch

### Key Parameters

| Parameter | Value | Unit |
|---|---|---|
| $-BV_{DSS}$ | 30 | V |
| $R_{DS(ON)}$ Max | 26 @ $-V_{GS}$ = 10 V | mΩ |
| | 42 @ $-V_{GS}$ = 4.5 V | |
| $-V_{GS(th)}$ typ | 1.5 | V |
| $Q_g$ typ | 22 @ $-V_{GS}$ = 10 V | nC |

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

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $-V_{DS}$ | 30 | V |
| Gate-Source Voltage | | $V_{GS}$ | ± 20 | V |
| Drain Current | $T_c$ = 25℃ | $-I_D$ | 25 | A |
| | $T_c$ = 100℃ | | 17 | |
| Peak Drain Current, Pulsed [1] | | $-I_{DM}$ | 100 | A |
| Single-Pulse Avalanche Current | | $-I_{AS}$ | 24 | A |
| Single-Pulse Avalanche Energy [2] | | $E_{AS}$ | 28.8 | mJ |
| Power Dissipation | $T_c$ = 25℃ | $P_D$ | 25 | W |
| | $T_c$ = 100℃ | | 10 | |
| 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 | $R_{\theta JC}$ | 5 | ℃/W |
| Thermal Resistance from Junction to Ambient [3] | $R_{\theta JA}$ | 50 | ℃/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, $-I_D$ = 24 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.



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Dated: 28/09/2020 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 | $-BV_{DSS}$ | 30 | - | - | V |
| Drain-Source Leakage Current<br>at $-V_{DS}$ = 30 V | $-I_{DSS}$ | - | - | 1 | μA |
| Gate 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 | 1.5 | 2.5 | V |
| Drain-Source On-State Resistance<br>at $-V_{GS}$ = 10 V, $-I_D$ = 9.1 A<br>at $-V_{GS}$ = 4.5 V, $-I_D$ = 6.9 A | $R_{DS(on)}$ | -<br>- | 22<br>34 | 26<br>42 | mΩ |
| **DYNAMIC PARAMETERS** | | | | | |
| Forward Transconductance<br>at $-V_{DS}$ = 10 V, $-I_D$ = 9.1 A | $g_{fs}$ | - | 10 | - | S |
| Gate Resistance<br>at $V_{DS}$ = 0 V, $V_{GS}$ = 0 V, f = 1 MHz | $R_g$ | - | 5 | - | Ω |
| Input Capacitance<br>at $-V_{DS}$ = 15 V, $V_{GS}$ = 0 V, f = 1 MHz | $C_{iss}$ | - | 1264 | - | pF |
| Output Capacitance<br>at $-V_{DS}$ = 15 V, $V_{GS}$ = 0 V, f = 1 MHz | $C_{oss}$ | - | 120 | - | pF |
| Reverse Transfer Capacitance<br>at $-V_{DS}$ = 15 V, $V_{GS}$ = 0 V, f = 1 MHz | $C_{rss}$ | - | 80 | - | pF |
| Total Gate Charge<br>at $-V_{GS}$ = 10 V, $-V_{DS}$ = 15 V, $-I_D$ = 10 A<br>at $-V_{GS}$ = 4.5 V, $-V_{DS}$ = 15 V, $-I_D$ = 10 A | $Q_g$ | -<br>- | 22<br>10 | -<br>- | nC |
| Gate-Source Charge<br>at $-V_{GS}$ = 10 V, $-V_{DS}$ = 15 V, $-I_D$ = 10 A | $Q_{gs}$ | - | 4.7 | - | nC |
| Gate-Drain Charge<br>at $-V_{GS}$ = 10 V, $-V_{DS}$ = 15 V, $-I_D$ = 10 A | $Q_{gd}$ | - | 3.3 | - | nC |
| Turn-On Delay Time<br>at $-V_{DD}$ = 15 V, $-V_{GS}$ = 10 V, $-I_D$ = 10 A, $R_g$ = 2.7 Ω | $t_{d(on)}$ | - | 9 | - | nS |
| Turn-On Rise Time<br>at $-V_{DD}$ = 15 V, $-V_{GS}$ = 10 V, $-I_D$ = 10 A, $R_g$ = 2.7 Ω | $t_r$ | - | 27 | - | nS |
| Turn-Off Delay Time<br>at $-V_{DD}$ = 15 V, $-V_{GS}$ = 10 V, $-I_D$ = 10 A, $R_g$ = 2.7 Ω | $t_{d(off)}$ | - | 14 | - | nS |
| Turn-Off Fall Time<br>at $-V_{DD}$ = 15 V, $-V_{GS}$ = 10 V, $-I_D$ = 10 A, $R_g$ = 2.7 Ω | $t_f$ | - | 3 | - | nS |
| **Body-Diode PARAMETERS** | | | | | |
| Body Diode Voltage<br>at $-I_S$ = 2 A, $V_{GS}$ = 0 V | $-V_{SD}$ | - | 0.8 | 1.2 | V |
| Body-Diode Continuous Current | $-I_S$ | - | - | 25 | A |
| Body-Diode Continuous Current, Pulsed | $-I_{SM}$ | - | - | 100 | A |
| Body Diode Reverse Recovery Time<br>at $-I_S$ = 10 A, di/dt = 100 A / μs | $t_{rr}$ | - | 9.6 | - | nS |
| Body Diode Reverse Recovery Charge<br>at $-I_S$ = 10 A, di/dt = 100 A / μs | $Q_{rr}$ | - | 3.3 | - | nC |

## Electrical Characteristics Curves

Fig. 1 Typical Output Characteristic

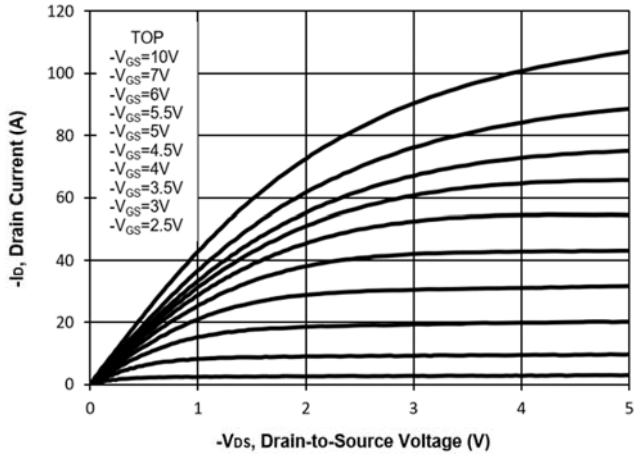



Fig. 2 Typical Transfer Characteristic

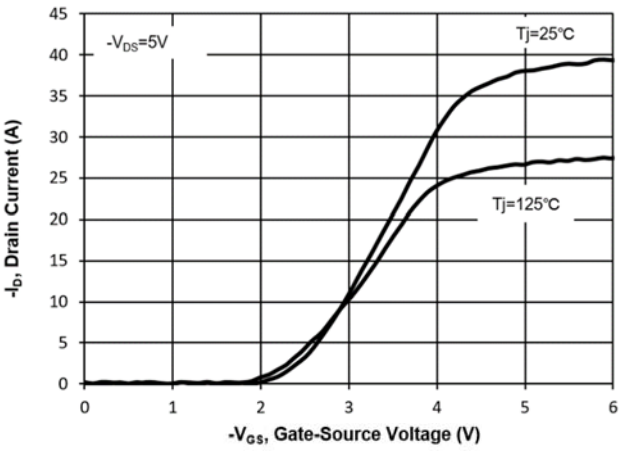



Fig. 3 on-Resistance vs. Drain Current

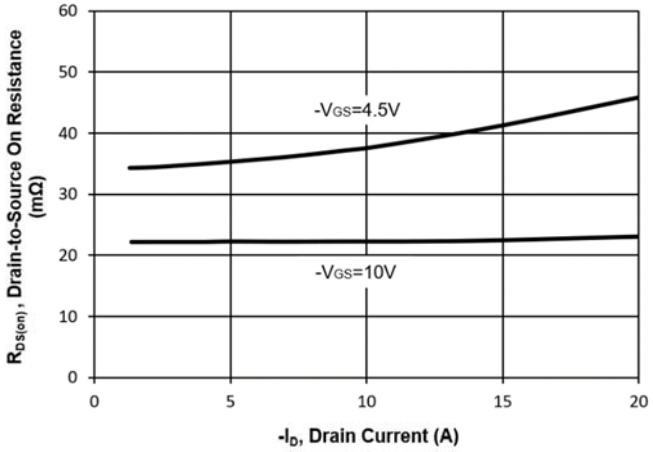



Fig. 4 on-Resistance vs. Gate Voltage

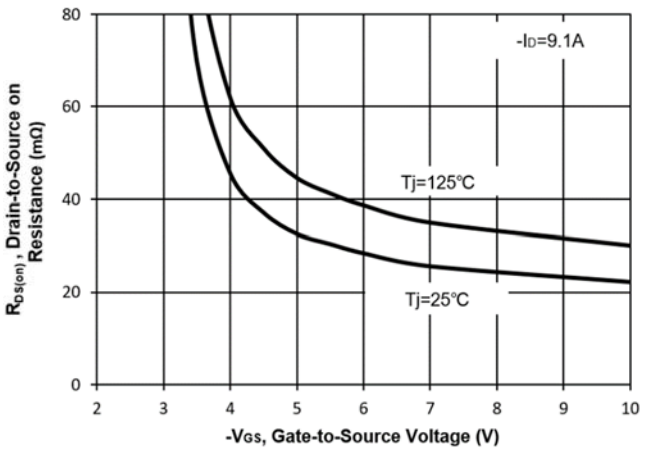



Fig. 5 on-Resistance vs.$T_j$

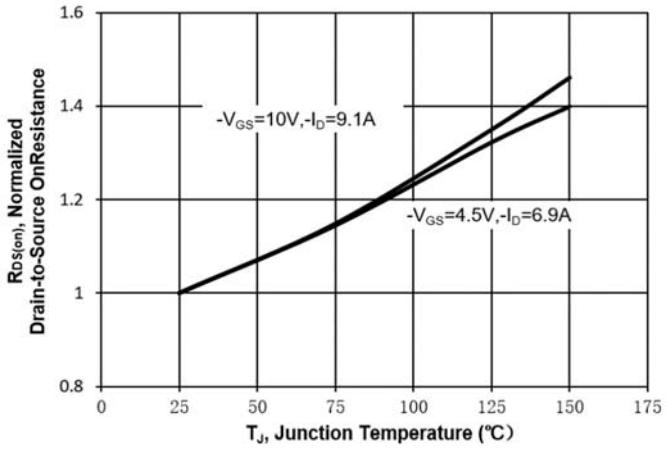
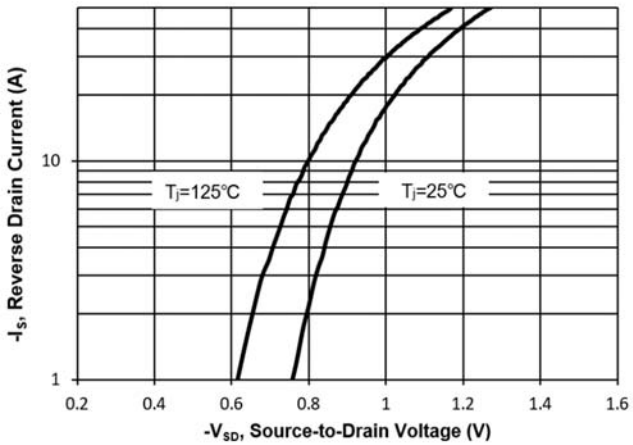



Fig. 6 Typical Forward Characteristic



## Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

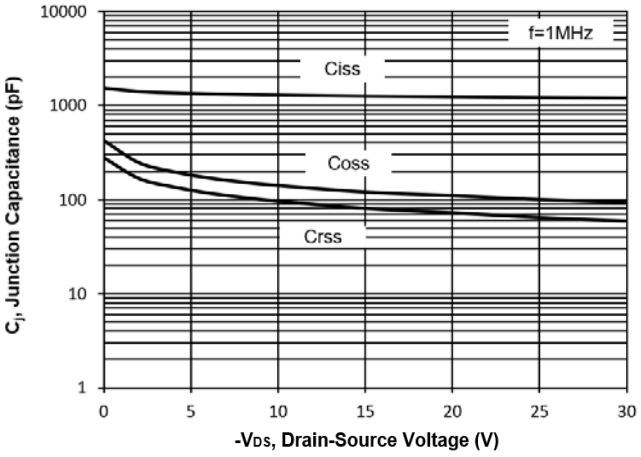



Fig. 8 Drain-Source Leakage Current vs. $T_j$

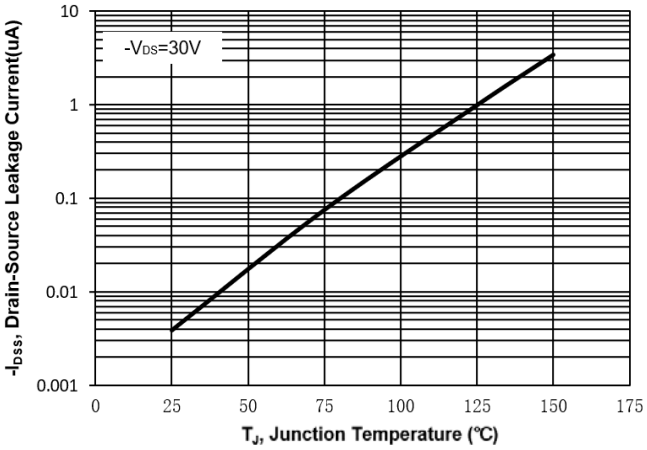



Fig. 9 $V_{(BR)DSS}$ vs. Junction Temperature

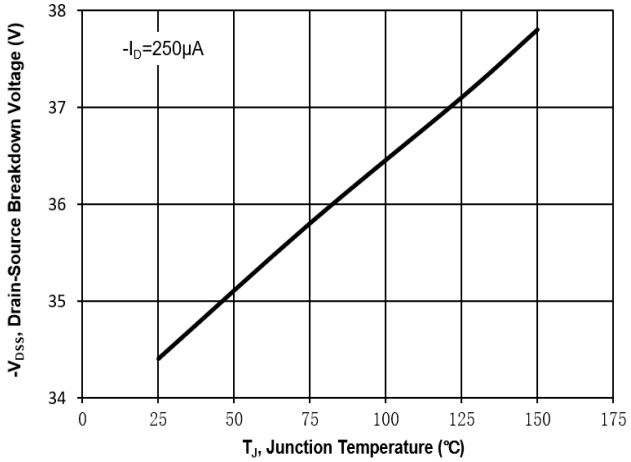



Fig. 10 Gate Threshold Variation vs. $T_j$

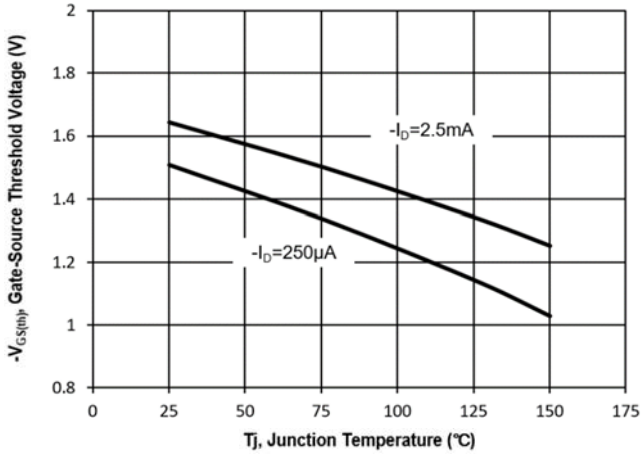



Fig. 11 Gate Charge

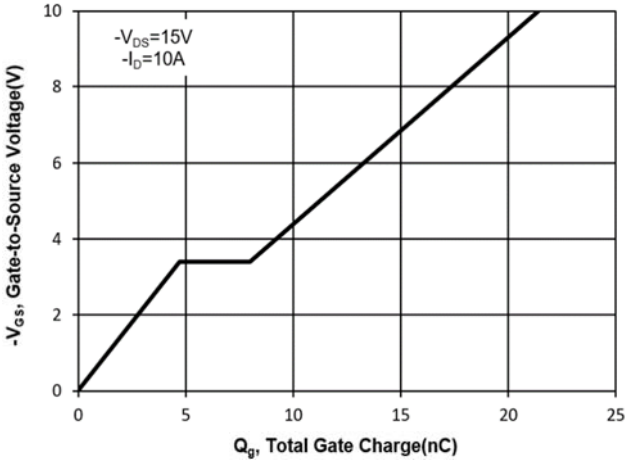
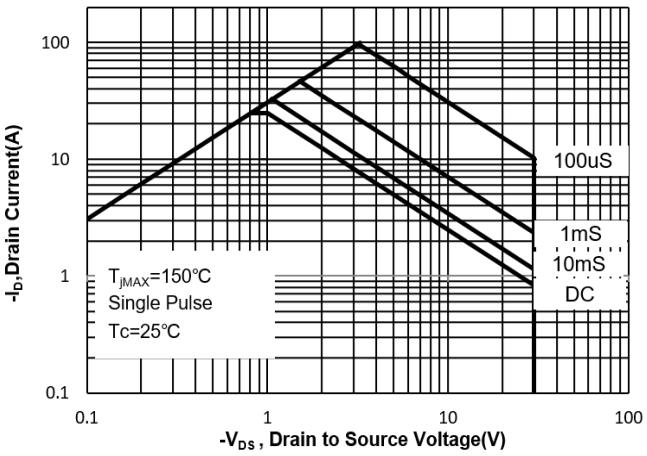



Fig. 12 Safe Operation Area



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## Electrical Characteristics Curves

Fig.13 Normalized Maximum Transient Thermal Impedance($Z_{\theta JC}$)

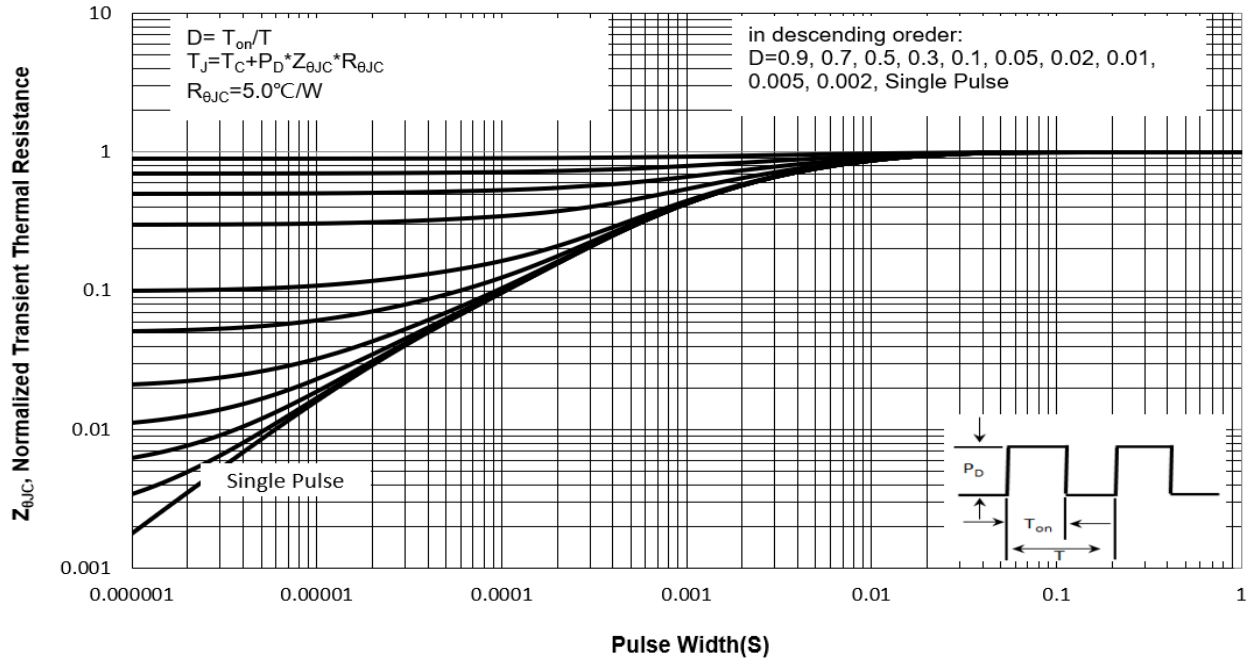
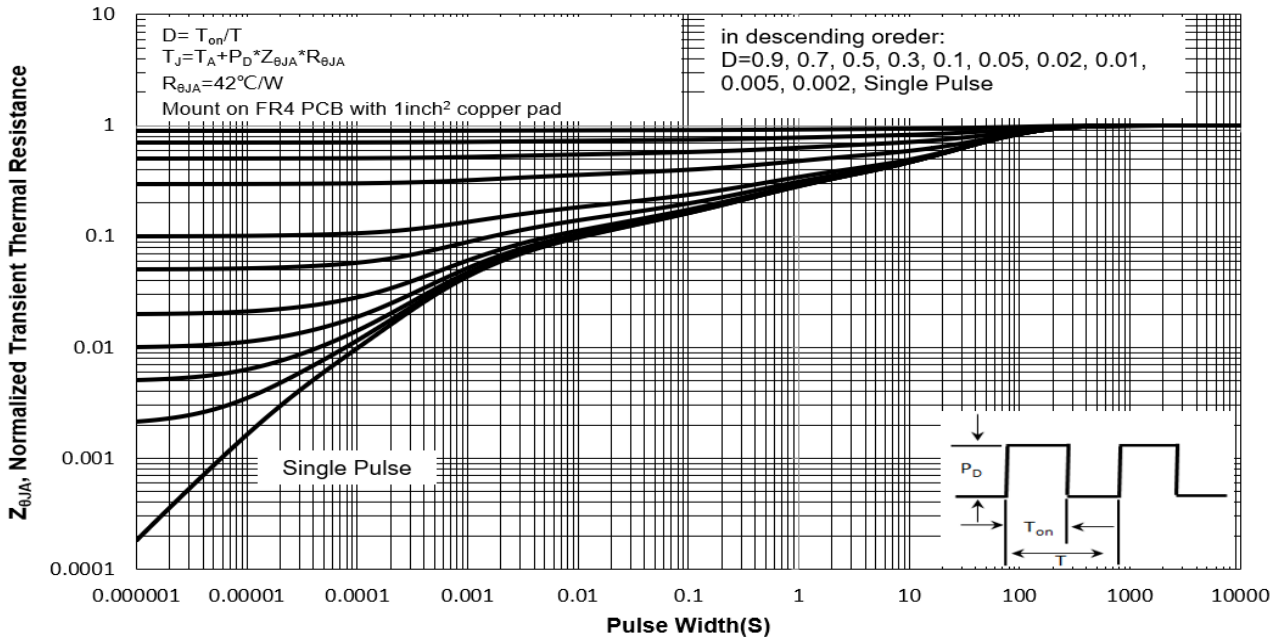



Fig.14 Normalized Maximum Transient Thermal Impedance($Z_{\theta JA}$)



**Test Circuits**

Fig.1-1 Switching times test circuit

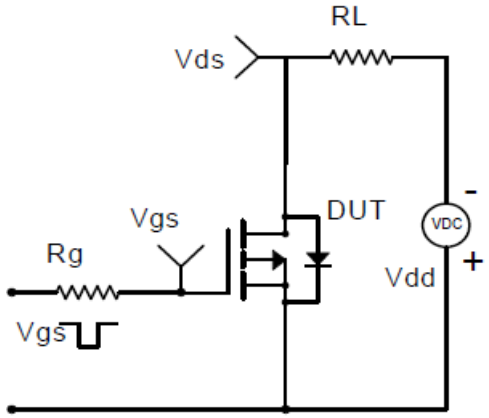



Fig.1-2 Switching Waveform

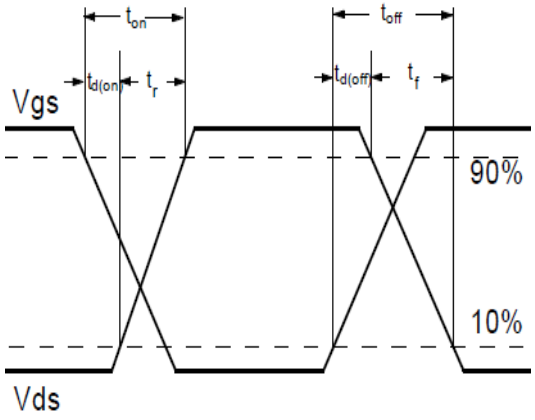



Fig.2-1 Gate charge test circuit

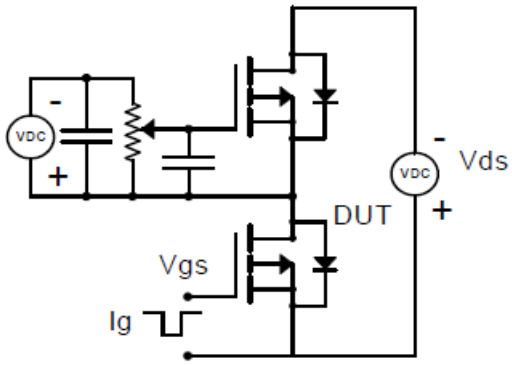



Fig.2-2 Gate charge waveform

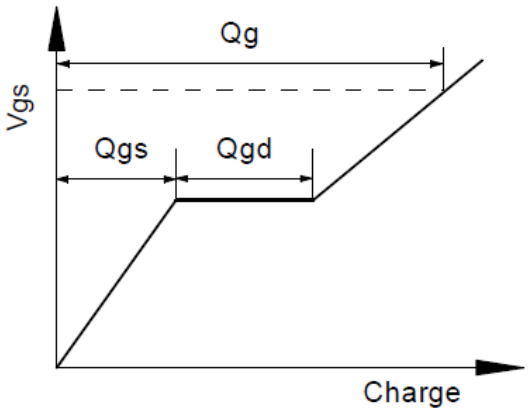



Fig.3-1 Avalanche test circuit

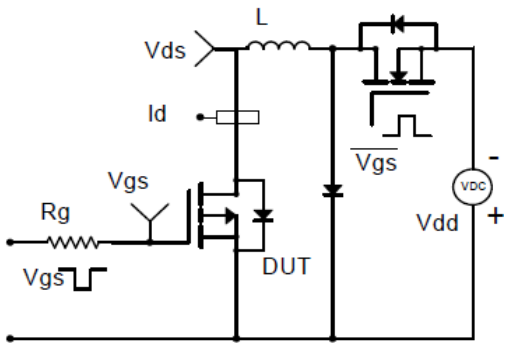
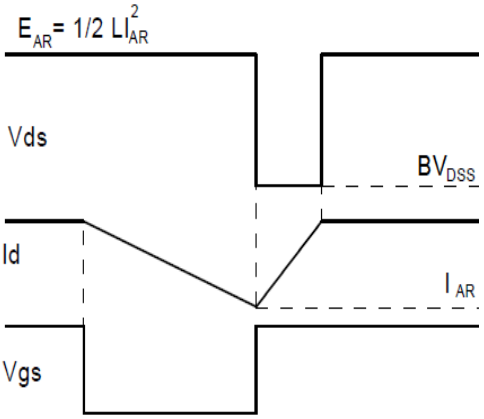
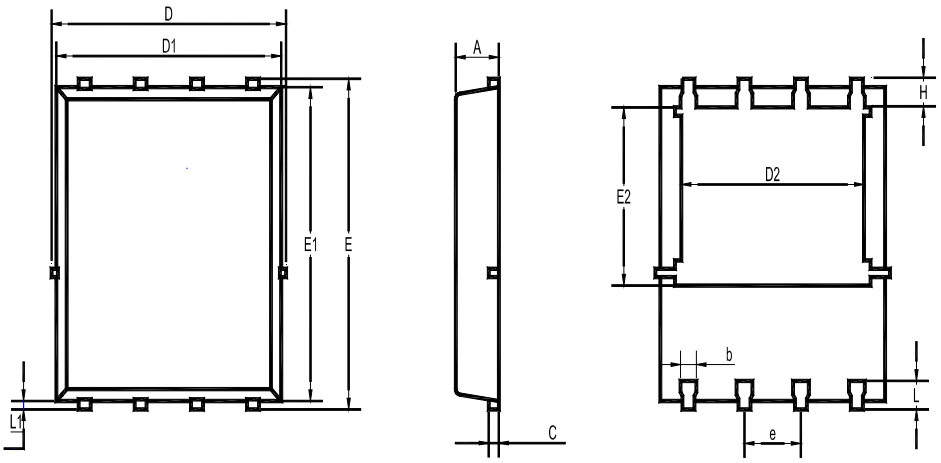



Fig.3-2 Avalanche waveform

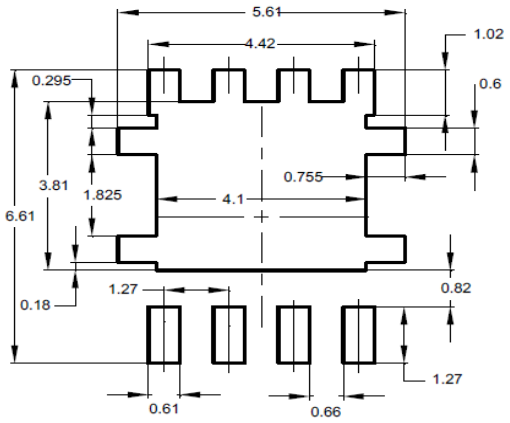


## Package Outline Dimensions (Units: mm) DFN5060




| UNIT | A | b | C | D | D1 | D2 | E | E1 | E2 | e | L | L1 | H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.12<br>0.9 | 0.51<br>0.33 | 0.34<br>0.11 | 5.26<br>4.7 | 5.1<br>4.7 | 4. 5<br>3.56 | 6.25<br>5.75 | 6<br>5.6 | 3.66<br>3.18 | 1.37<br>1.17 | 0.71<br>0.35 | 0.2<br>0.06 | 0.71<br>0.35 |

## Recommended Soldering Footprint




## Packing information

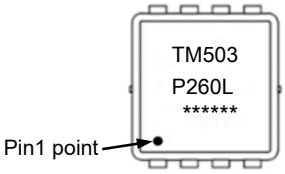
| Package | Tape Width (mm) | Pitch | | Reel Size | | Per Reel Packing Quantity |
|---|---|---|---|---|---|---|
| | | mm | inch | mm | inch | |
| DFN5060 | 12 | 8 ± 0.1 | 0.315 ± 0.004 | 330 | 13 | 3,000 |

## Marking information

" TM503P260L " = Part No.

" ****** " = Date Code Marking

Font type: Arial



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