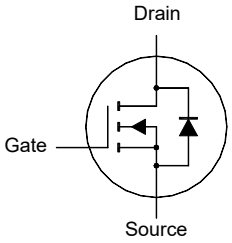
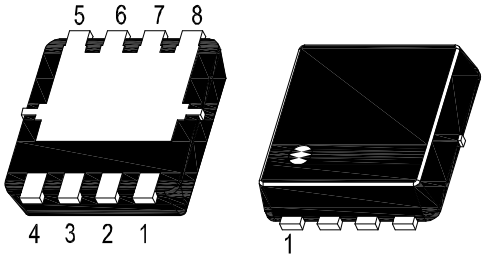
# WDM3E6N200LS-AH

## N-Channel Enhancement Mode MOSFET

**Features**

- AEC-Q101 Qualified
- Low $R_{DS(ON)}$
- Halogen and Antimony Free(HAF), RoHS compliant




1. Source 2. Source 3. Source 4. Gate
5. Drain 6. Drain 7. Drain 8. Drain
DFN3030 Plastic Package

**Application**

- DC-DC Power Management

**Key Parameters**

| Parameter | Value | Unit |
|---|---|---|
| $BV_{DSS}$ | 65 | V |
| $R_{DS(ON)}$ Max | 20 @ $V_{GS}$ = 10 V | mΩ |
| | 30 @ $V_{GS}$ = 4.5 V | |
| $V_{GS(th)}$ typ | 1.5 | V |
| $Q_g$ typ | 9 @ $V_{GS}$ = 10 V | nC |

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

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 65 | V |
| Gate-Source Voltage | | $V_{GS}$ | ± 20 | V |
| Drain Current | $T_c$ = 25℃ | $I_D$ | 25 | A |
| | $T_c$ = 100℃ | | 15 | |
| Peak Drain Current, Pulsed [1] | | $I_{DM}$ | 80 | A |
| Avalanche Current | | $I_{AS}$ | 9.3 | A |
| Single Pulse Avalanche Energy [2] | | $E_{AS}$ | 4.3 | mJ |
| Power Dissipation | $T_c$ = 25℃ | $P_{tot}$ | 25 | 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 | | $R_{\theta JC}$ | 5 | ℃/W |
| Thermal Resistance from Junction to Ambient [3] | Steady State | $R_{\theta JA}$ | 45 | ℃/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, $I_D$ = 9.3 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: 03/03/2021 Rev: 01

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

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| **STATIC PARAMETERS** | | | | | |
| Drain-Source Breakdown Voltage<br>at $I_D$ = 1 mA | $BV_{DSS}$ | 65 | - | - | V |
| Drain-Source Leakage Current<br>at $V_{DS}$ = 52 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 | $V_{GS(th)}$ | 1.4 | - | 2.5 | V |
| Drain-Source On-State Resistance<br>at $V_{GS}$ = 10 V, $I_D$ = 8 A<br>at $V_{GS}$ = 4.5 V, $I_D$ = 5 A | $R_{DS(on)}$ | -<br>- | 15.8<br>- | 20<br>30 | mΩ |
| **DYNAMIC PARAMETERS** | | | | | |
| Forward Transconductance<br>at $V_{DS}$ = 5 V, $I_D$ = 5 A | $g_{fs}$ | - | 9.6 | - | S |
| Gate Resistance<br>at $V_{GS}$ = 0 V, $V_{DS}$ = 0 V, f = 1 MHz | $R_g$ | - | 1.2 | - | Ω |
| Input Capacitance<br>at $V_{GS}$ = 0 V, $V_{DS}$ = 30 V, f = 1 MHz | $C_{iss}$ | - | 406 | - | pF |
| Output Capacitance<br>at $V_{GS}$ = 0 V, $V_{DS}$ = 30 V, f = 1 MHz | $C_{oss}$ | - | 147 | - | pF |
| Reverse Transfer Capacitance<br>at $V_{GS}$ = 0 V, $V_{DS}$ = 30 V, f = 1 MHz | $C_{rss}$ | - | 18 | - | pF |
| Gate charge total<br>at $V_{DS}$ = 30 V, $I_D$ = 8 A, $V_{GS}$ = 10 V<br>at $V_{DS}$ = 30 V, $I_D$ = 8 A, $V_{GS}$ = 4.5 V | $Q_g$ | -<br>- | 9<br>5 | -<br>- | nC |
| Gate to Source Charge<br>at $V_{DS}$ = 30 V, $I_D$ = 8 A, $V_{GS}$ = 10 V | $Q_{gs}$ | - | 1.5 | - | nC |
| Gate to Drain Charge<br>at $V_{DS}$ = 30 V, $I_D$ = 8 A, $V_{GS}$ = 10 V | $Q_{gd}$ | - | 2.6 | - | nC |
| Turn-On Delay Time<br>at $V_{DS}$ = 30 V, $V_{GS}$ = 10 V, $I_D$ = 8 A, $R_g$ = 3.3 Ω | $t_{d(on)}$ | - | 6 | - | nS |
| Turn-On Rise Time<br>at $V_{DS}$ = 30 V, $V_{GS}$ = 10 V, $I_D$ = 8 A, $R_g$ = 3.3 Ω | $t_r$ | - | 7 | - | nS |
| Turn-Off Delay Time<br>at $V_{DS}$ = 30 V, $V_{GS}$ = 10 V, $I_D$ = 8 A, $R_g$ = 3.3 Ω | $t_{d(off)}$ | - | 6 | - | nS |
| Turn-Off Fall Time<br>at $V_{DS}$ = 30 V, $V_{GS}$ = 10 V, $I_D$ = 8 A, $R_g$ = 3.3 Ω | $t_f$ | - | 1 | - | nS |
| **Body-Diode PARAMETERS** | | | | | |
| Drain-Source Diode Forward Voltage<br>at $I_S$ = 1 A, $V_{GS}$ = 0 V | $V_{SD}$ | - | - | 1.3 | V |
| Body-Diode Continuous Current | $I_S$ | - | - | 25 | A |
| Body-Diode Continuous Current, Pulsed | $I_{SM}$ | - | - | 80 | A |
| Body Diode Reverse Recovery Time<br>at $I_S$ = 8 A, di/dt = 100 A / μs | $t_{rr}$ | - | 12 | - | nS |
| Body Diode Reverse Recovery Charge<br>at $I_S$ = 8 A, di/dt = 100 A / μs | $Q_{rr}$ | - | 4 | - | nC |

## Electrical Characteristics Curves

Fig. 1 Typical Output Characteristic

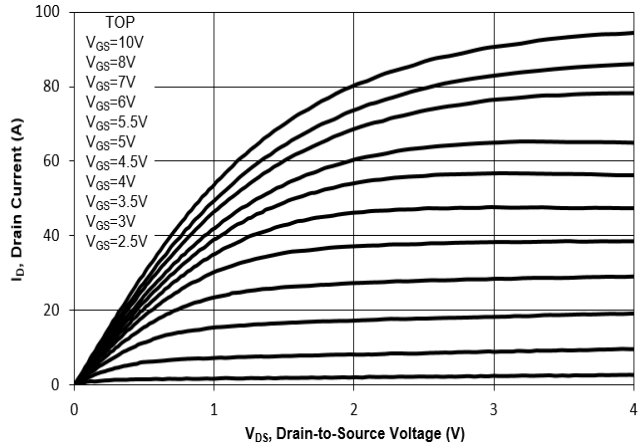



Fig. 2 Typical Transfer Characteristic

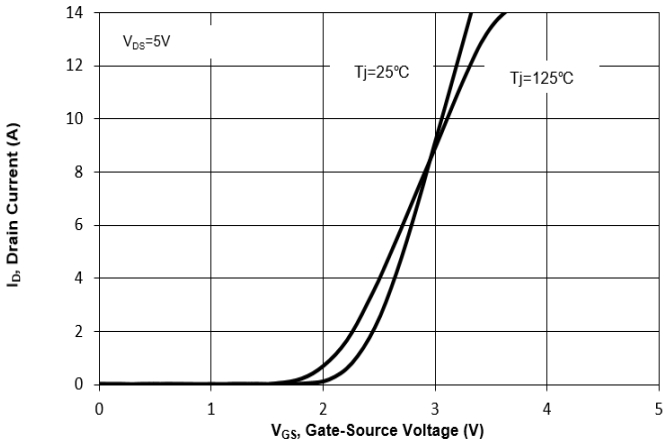



Fig. 3 On-Resistance vs. Drain Current

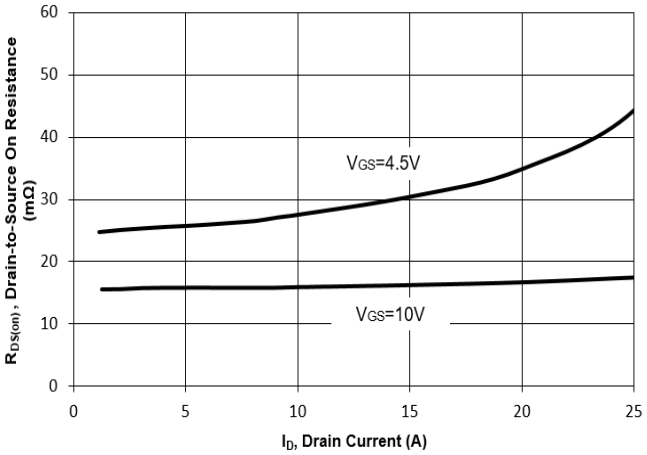



Fig. 4 On-Resistance vs. Gate Voltage

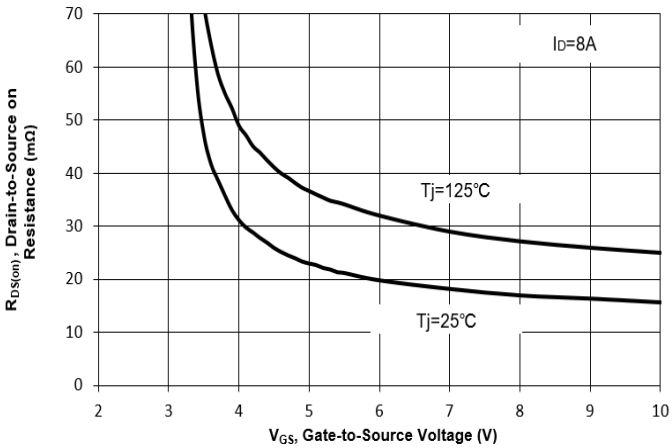



Fig. 5 On-Resistance vs.$T_j$

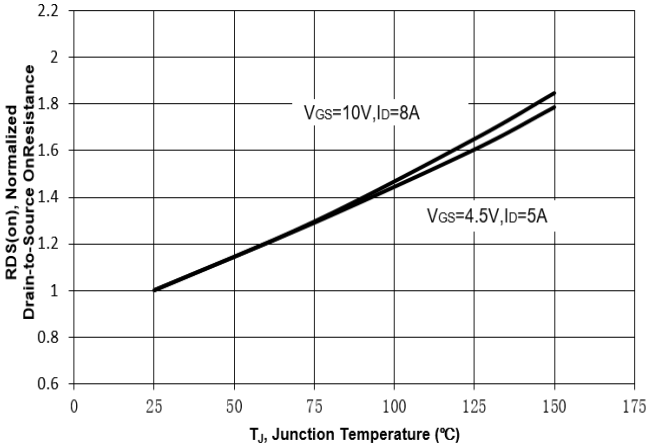
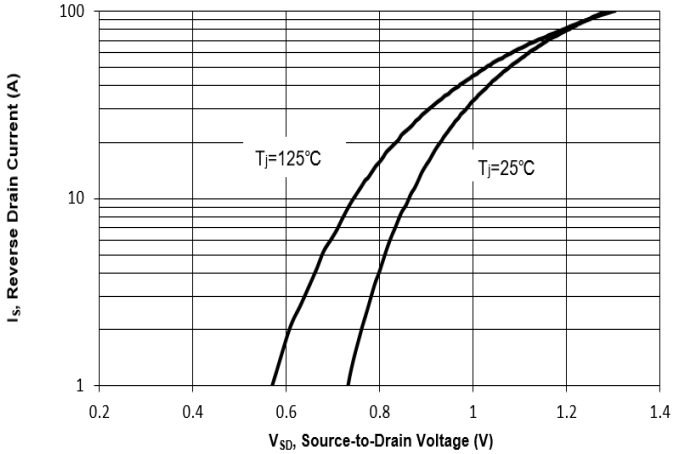



Fig. 6 Typical Forward Characteristic



## Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

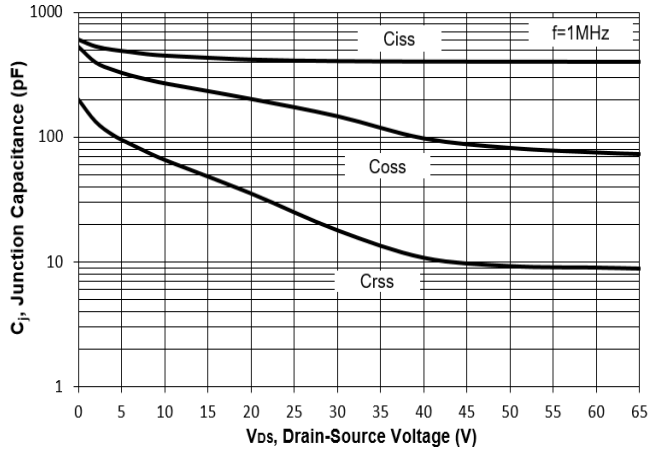



Fig. 8 Drain-Source Leakage Current vs. $T_j$

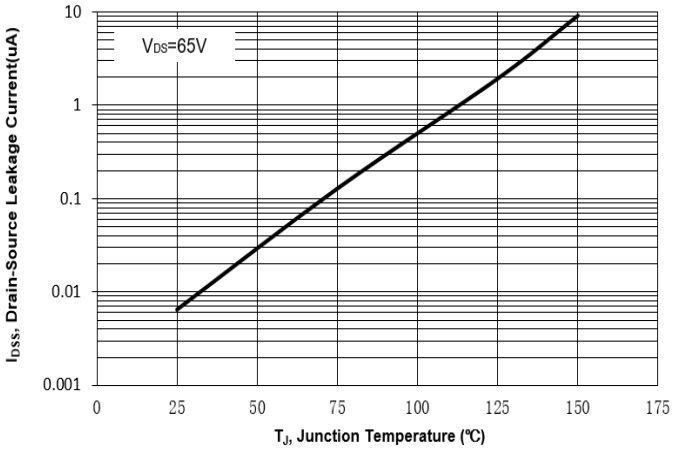



Fig. 9 $V_{(BR)DSS}$ vs. Junction Temperature

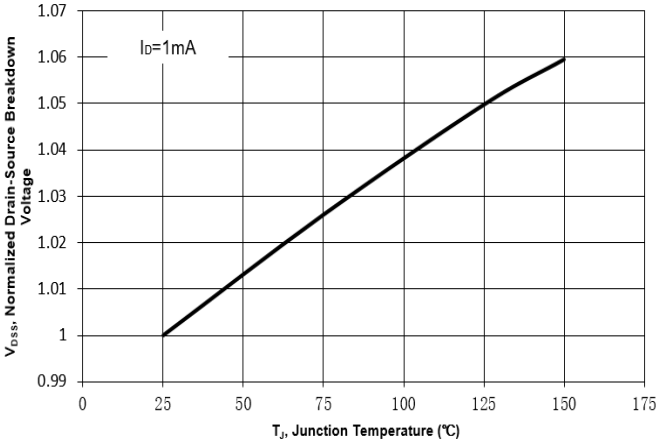



Fig. 10 Gate Threshold Variation vs. $T_j$

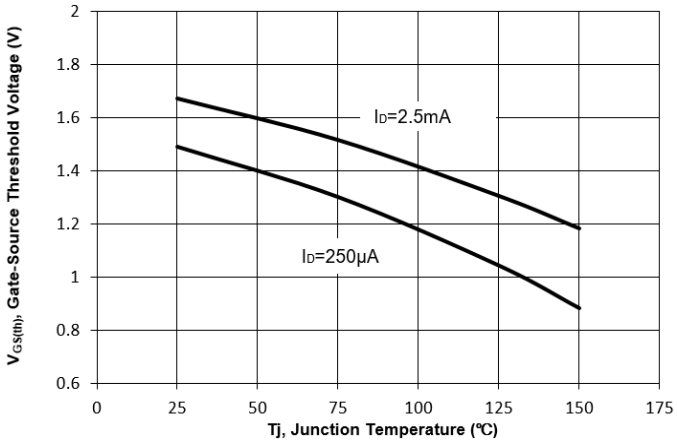



Fig. 11 Gate Charge

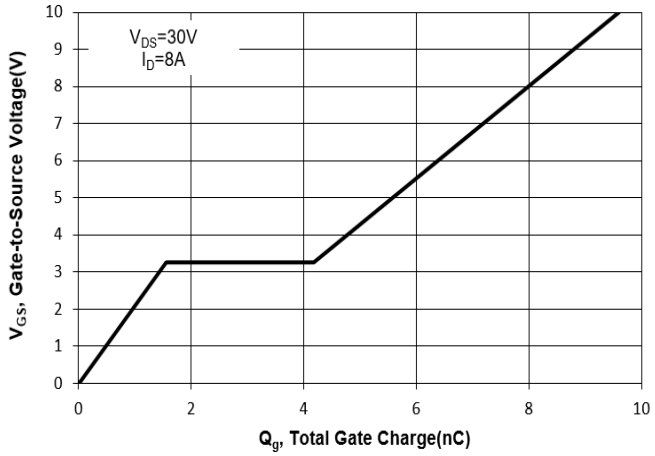
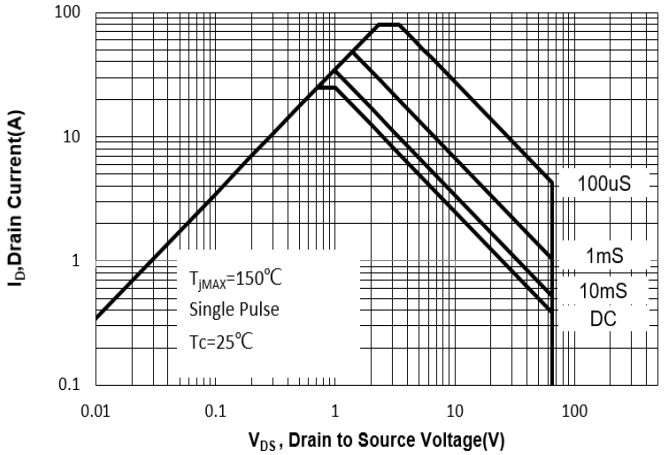



Fig. 12 Safe Operation Area



## Electrical Characteristics Curves

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

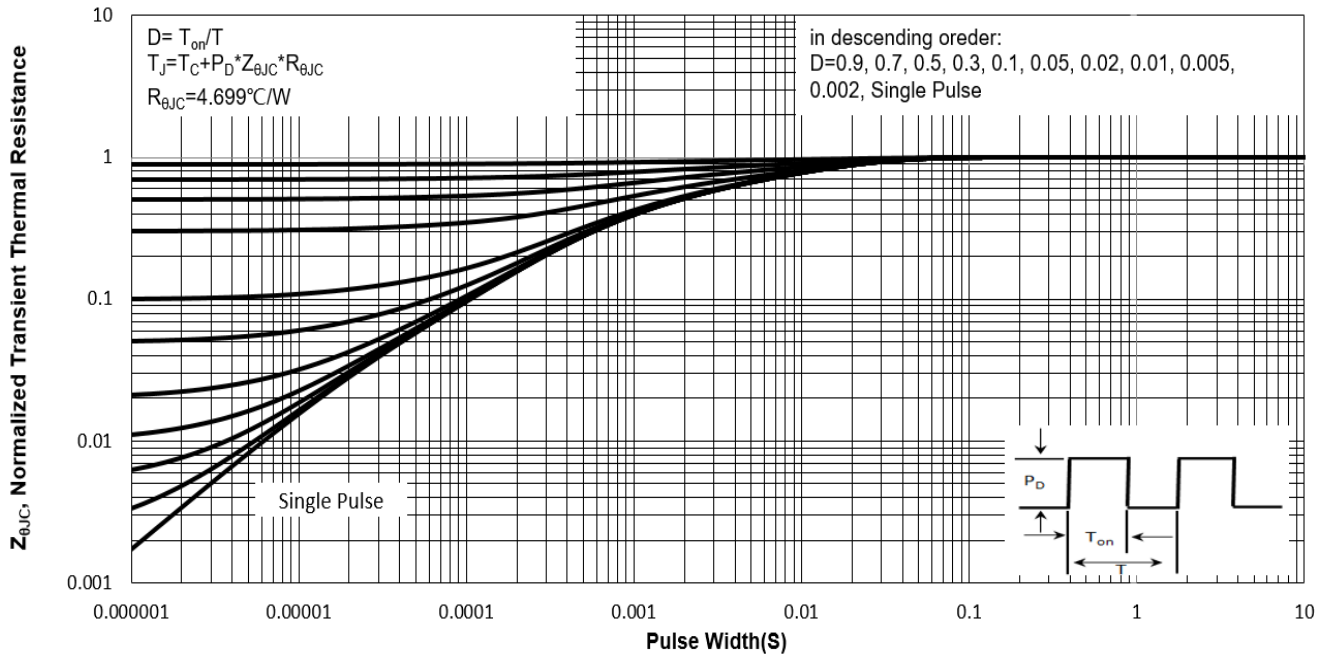
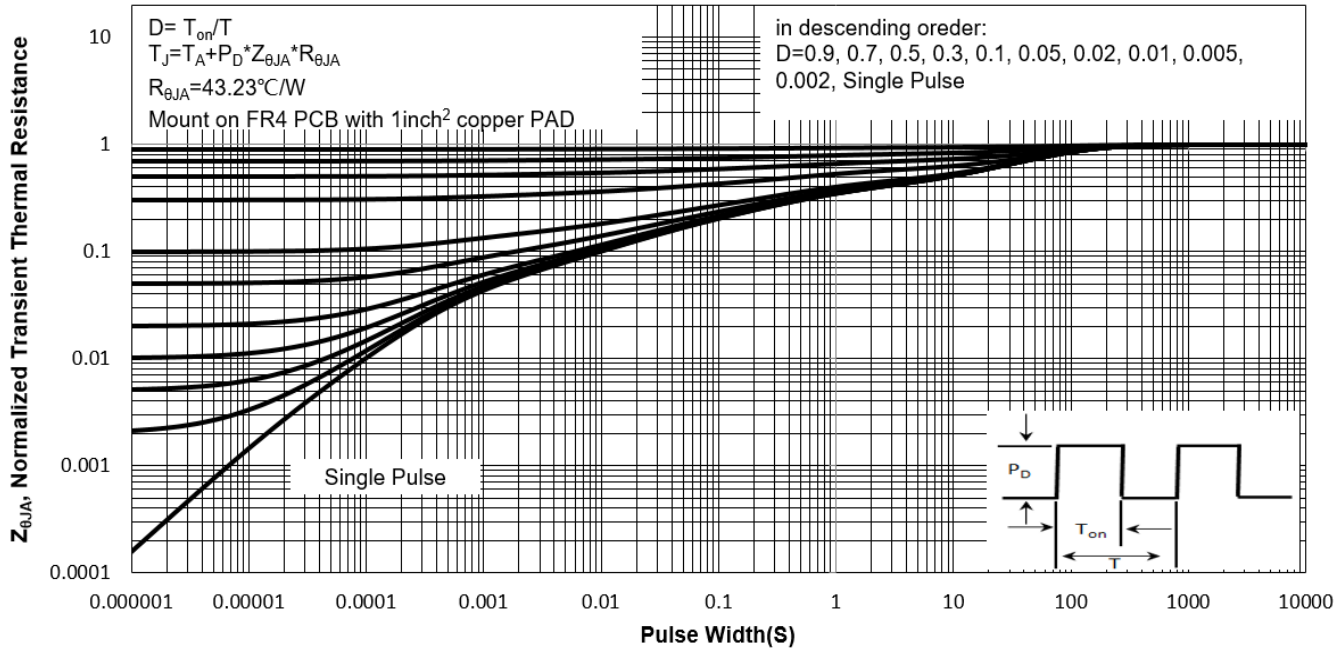



Fig. 14 Normalized Maximum Transient Thermal Impedance($z_{\Theta JA}$)



## Test Circuits

Fig.1-1 Switching times test circuit

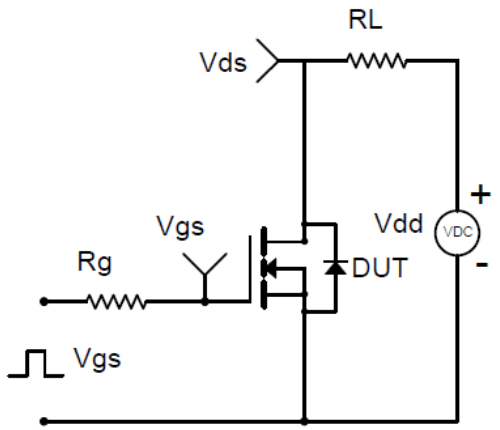



Fig.1-2 Switching Waveform

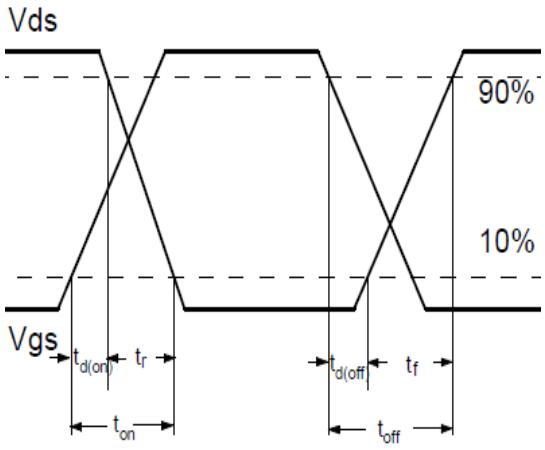



Fig.2-1 Gate charge test circuit

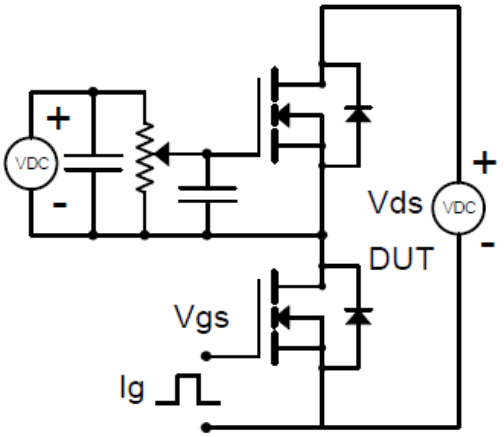



Fig.2-2 Gate charge waveform

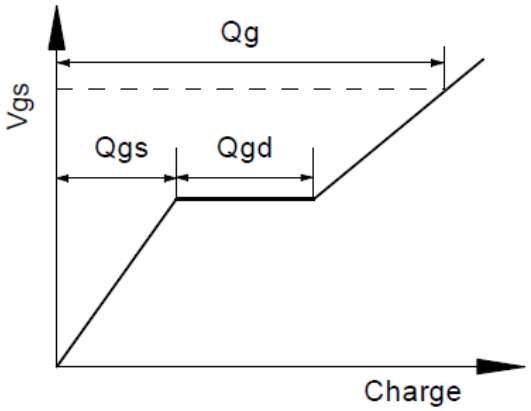



Fig.3-1 Avalanche test circuit

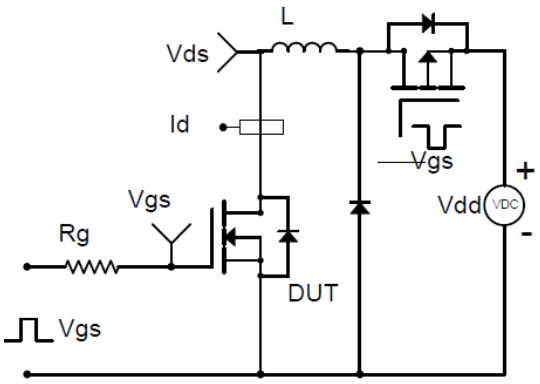
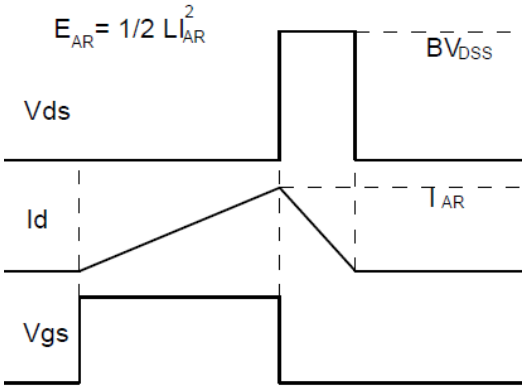
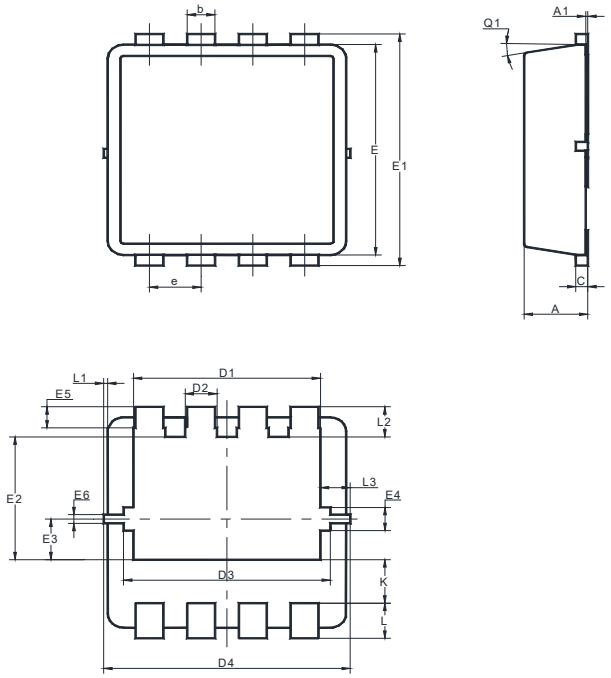



Fig.3-2 Avalanche waveform



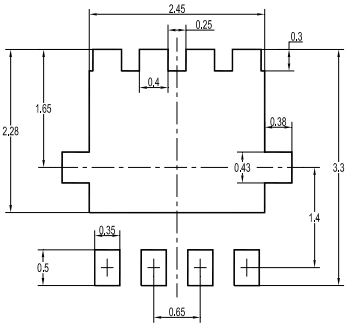
## Package Outline Dimensions (Units: mm) DFN3030




| UNIT | A | A1 | b | c | D1 | D2 | D3 | D4 | E | E1 | E2 | E3 | E4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 0.9 | 0.05 | 0.35 | 0.25 | 2.6 | 0.5 | 2.7 | 3.2 | 3.1 | 3.3 | 1.85 | 0.68 | 0.43 |
| | 0.7 | 0 | 0.24 | 0.1 | 2.4 | 0.3 | 2.5 | 3 | 2.9 | 3.1 | 1.65 | 0.48 | 0.23 |

| UNIT | E5 | E6 | e | K | L | L1 | L2 | L3 | θ1 |
|---|---|---|---|---|---|---|---|---|---|
| mm | 0.4 | 0.25 | 0.7 | 0.72 | 0.5 | 0.1 | 0.53 | 0.475 | 12° |
| | 0.2 | 0.15 | 0.6 | 0.52 | 0.3 | 0 | 0.33 | 0.275 | 0° |

## Recommended Soldering Footprint




## Packing information

| Package | Tape Width (mm) | Pitch | | Reel Size | | Per Reel Packing Quantity |
|---|---|---|---|---|---|---|
| | | mm | inch | mm | inch | |
| DFN3030 | 12 | 8 ± 0.1 | 0.315 ± 0.004 | 330 | 13 | 5,000 |

## Marking information

" DM3E6N200LS " = Part No.

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

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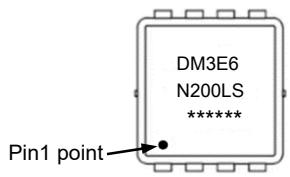

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