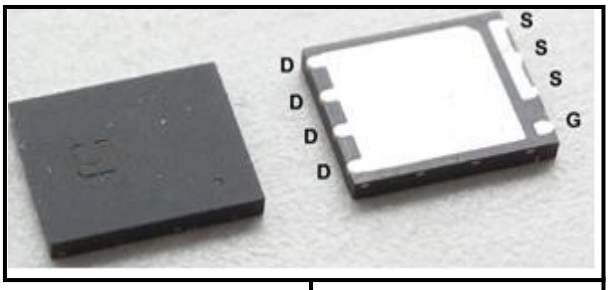
# 100V N-Channel DTMOS

## FEATURES

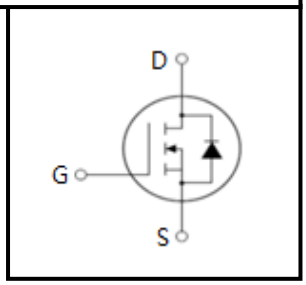
- Trench Power DTMOS Technology
- Low $R_{DS(ON)}$
- Low Gate Charge
- Optimized for Fast-switching Applications




## APPLICATIONS

- Synchronous Rectification in DC/DC and AC/DC Converters
- Isolated DC/DC Converters in Telecom and Industrial

RoHS




| Device Marking and Package Information | | |
|---|---|---|
| **Device** | **Package** | **Marking** |
| TSG12N10AT | DFN5×6 | 12N10AT |

| **Absolute Maximum Ratings** $T_C$ = 25ºC, unless otherwise noted | | | |
|---|---|---|---|
| **Parameter** | **Symbol** | **Value** | **Unit** |
| Drain-Source Voltage ($V_{GS}$ = 0V) | $V_{DSS}$ | 100 | V |
| Continuous Drain Current | $I_D$ | 55 | A |
| Pulsed Drain Current (note1) | $I_{DM}$ | 220 | A |
| Gate-Source Voltage | $V_{GSS}$ | ±20 | V |
| Single Pulse Avalanche Energy (note2) | $E_{AS}$ | 20 | mJ |
| Avalanche Current (note1) | $I_{As}$ | 20 | A |
| Power Dissipation ($T_C$ = 25ºC) | $P_D$ | 56.5 | W |
| Operating Junction and Storage Temperature Range | $T_J$, $T_{stg}$ | -55~+150 | ºC |

| **Thermal Resistance** | | | |
|---|---|---|---|
| **Parameter** | **Symbol** | **Value** | **Unit** |
| Thermal Resistance, Junction-to-Case | $R_{thJC}$ | 1.7 | ºC/W |
| Thermal Resistance, Junction-to-Ambient | $R_{thJA}$ | 50 | |

**Specifications** $T_J$ = 25ºC, unless otherwise noted

| Parameter | Symbol | Test Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| **Static** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0V, $I_D$ = 250μA | 100 | -- | -- | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 95V, $V_{GS}$ = 0V, $T_J$ = 25ºC | -- | -- | 1 | μA |
| | | $V_{DS}$ = 95V, $V_{GS}$ = 0V, $T_J$ = 150ºC | -- | -- | 100 | |
| Gate-Source Leakage | $I_{GSS}$ | $V_{GS}$ = ±20V | -- | -- | ±100 | nA |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 1.1 | -- | 2.5 | V |
| Drain-Source On-Resistance (Note3) | $R_{DS(on)}$ | $V_{GS}$ = 10V, $I_D$ = 20A | -- | 9 | 12 | mΩ |
| | | $V_{GS}$ = 4.5V, $I_D$ = 20A | -- | 12.5 | 15.5 | |
| Forward Transconductance (Note3) | $g_{fs}$ | $V_{DS}$ = 5V, $I_D$ = 20A | -- | 45 | -- | S |
| **Dynamic** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 50V, f = 1.0MHz | -- | 2455 | -- | pF |
| Output Capacitance | $C_{oss}$ | | -- | 153 | -- | |
| Reverse Transfer Capacitance | $C_{rss}$ | | -- | 12 | -- | |
| Total Gate Charge | $Q_g$(10V) | $V_{DD}$ = 50V, $I_D$ = 20A, $V_{GS}$ = 10V | -- | 45 | -- | nC |
| | $Q_g$(4.5V) | | -- | 24 | -- | |
| Gate-Source Charge | $Q_{gs}$ | | -- | 6.8 | -- | |
| Gate-Drain Charge | $Q_{gd}$ | | -- | 11.5 | -- | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$ = 50V, $I_D$ = 20A, $R_G$ = 3Ω | -- | 8 | -- | ns |
| Turn-on Rise Time | $t_r$ | | -- | 3 | -- | |
| Turn-off Delay Time | $t_{d(off)}$ | | -- | 25 | -- | |
| Turn-off Fall Time | $t_f$ | | -- | 4 | -- | |
| **Drain-Source Body Diode Characteristics** | | | | | | |
| Continuous Body Diode Current | $I_S$ | $T_C$ = 25ºC | -- | -- | 34 | A |
| Pulsed Diode Forward Current | $I_{SM}$ | | -- | -- | 102 | |
| Body Diode Voltage | $V_{SD}$ | $T_J$ = 25ºC, $I_{SD}$ = 1A, $V_{GS}$ = 0V | -- | 0.72 | 1 | V |
| Reverse Recovery Time | $t_{rr}$ | $I_F$ = 20A, $di_F/dt$ = 500A/μs | -- | 27 | -- | ns |
| Reverse Recovery Charge | $Q_{rr}$ | | -- | 128 | -- | nC |

**Notes**

1. Repetitive Rating: Pulse Width limited by maximum junction temperature
2. $I_{AS}$ = 20A, $V_{DD}$ = 50V, $R_G$ = 25Ω, Starting $T_J$ = 25°C
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 1%

**Typical Characteristics** $T_J$ = 25ºC, unless otherwise noted

**Figure 1. Output Characteristics**

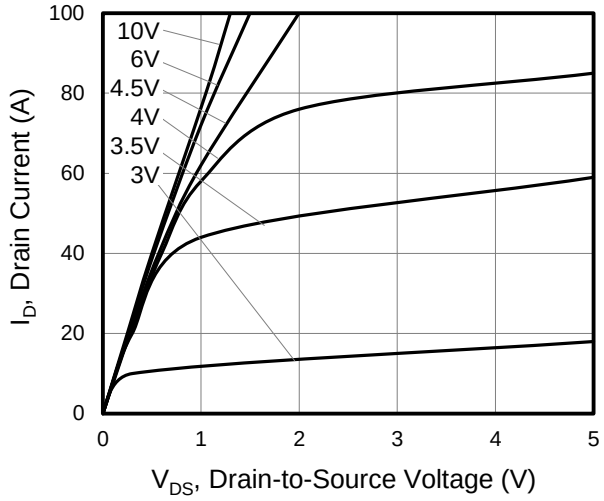



**Figure 2. Transfer Characteristics**

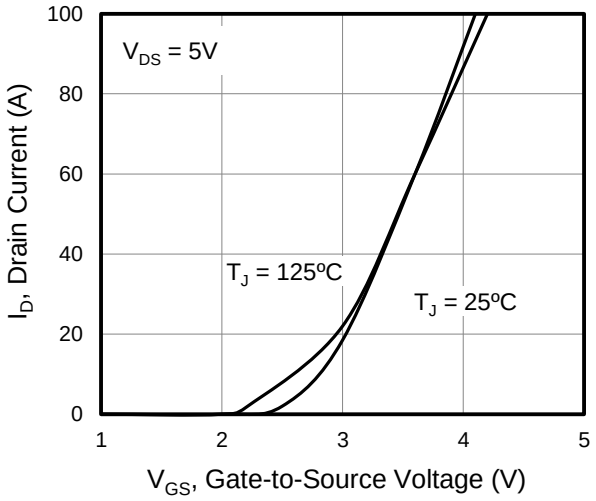



**Figure 3. On-Resistance vs. Drain Current**

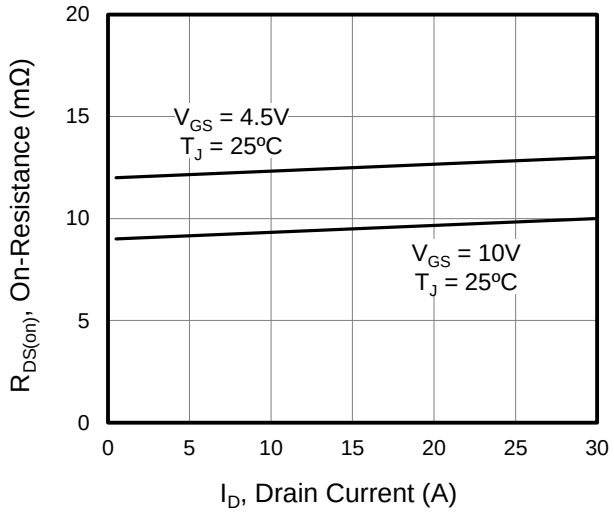



**Figure 4. Capacitance**

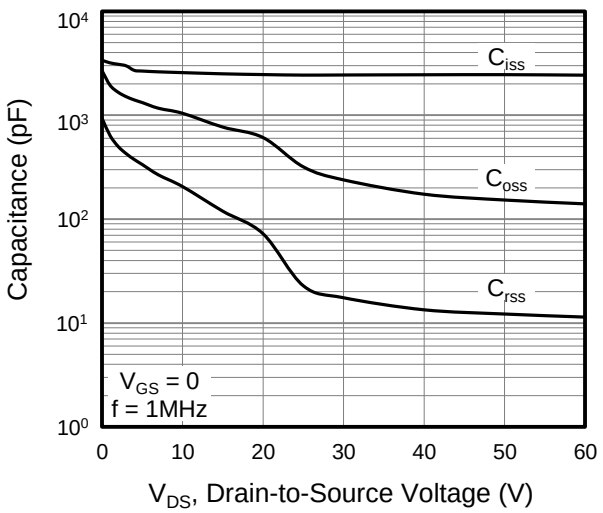



**Figure 5. Gate Charge**

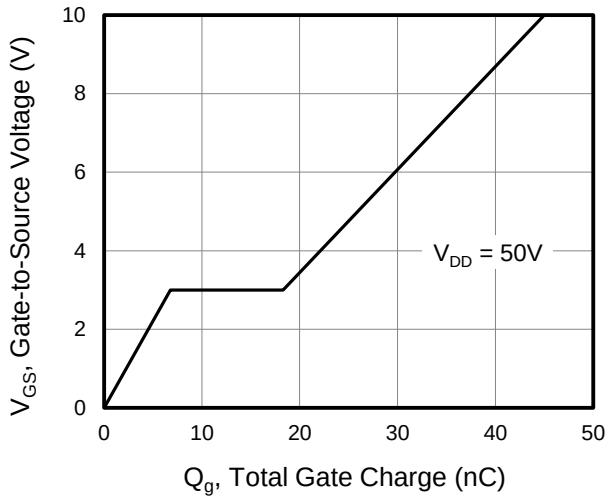
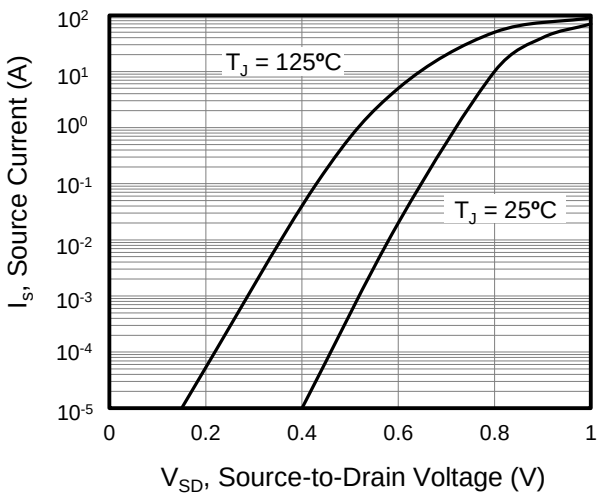



**Figure 6. Body Diode Forward Voltage**



**Typical Characteristics** $T_J$ = 25ºC, unless otherwise noted

**Figure 7. On-Resistance vs. Junction Temperature**

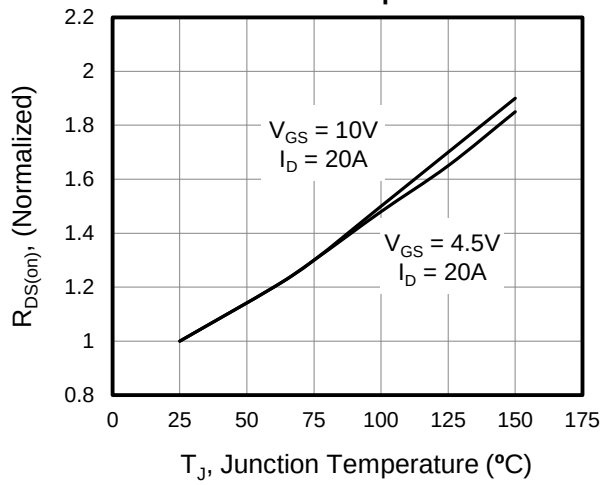



**Figure 8. Threshold Voltage vs. Junction Temperature**

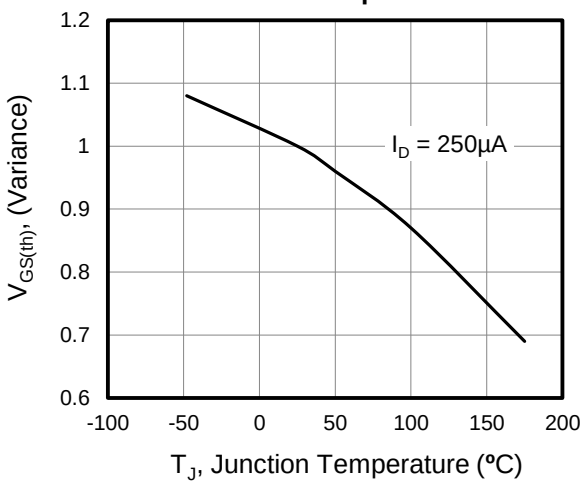



**Figure 9. Transient Thermal Impedance**

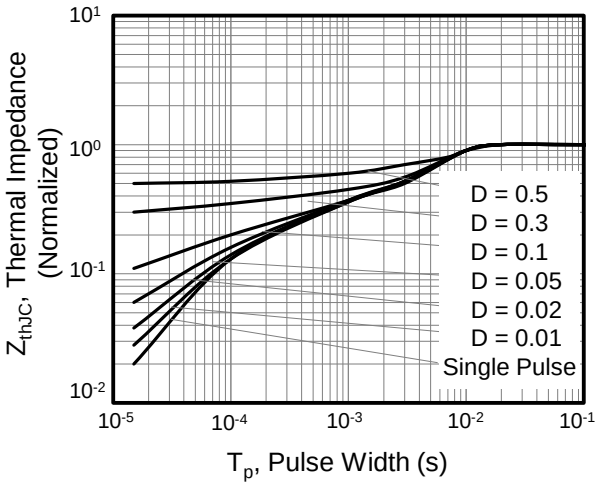


**Figure A：Gate Charge Test Circuit and Waveform**

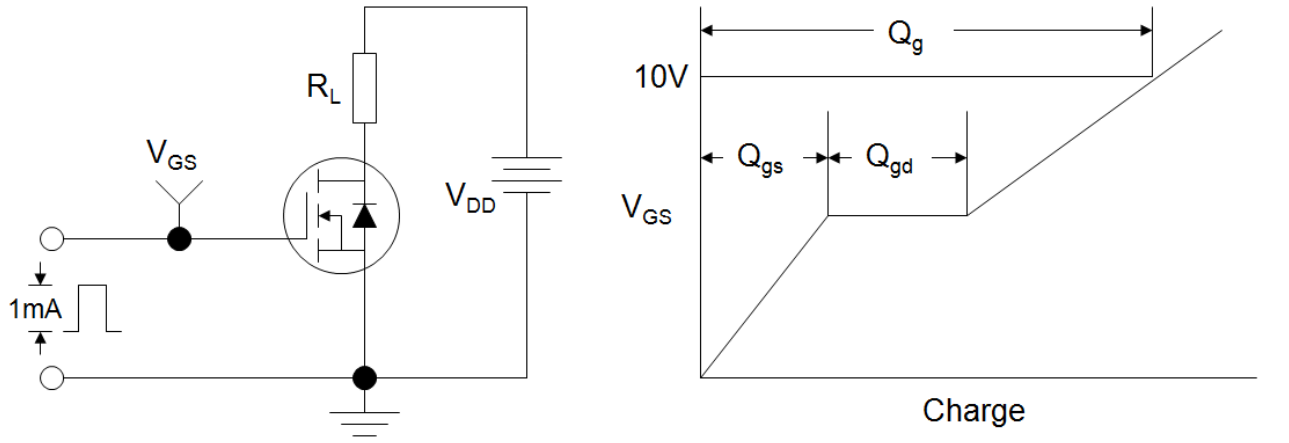



**Figure B：Resistive Switching Test Circuit and Waveform**

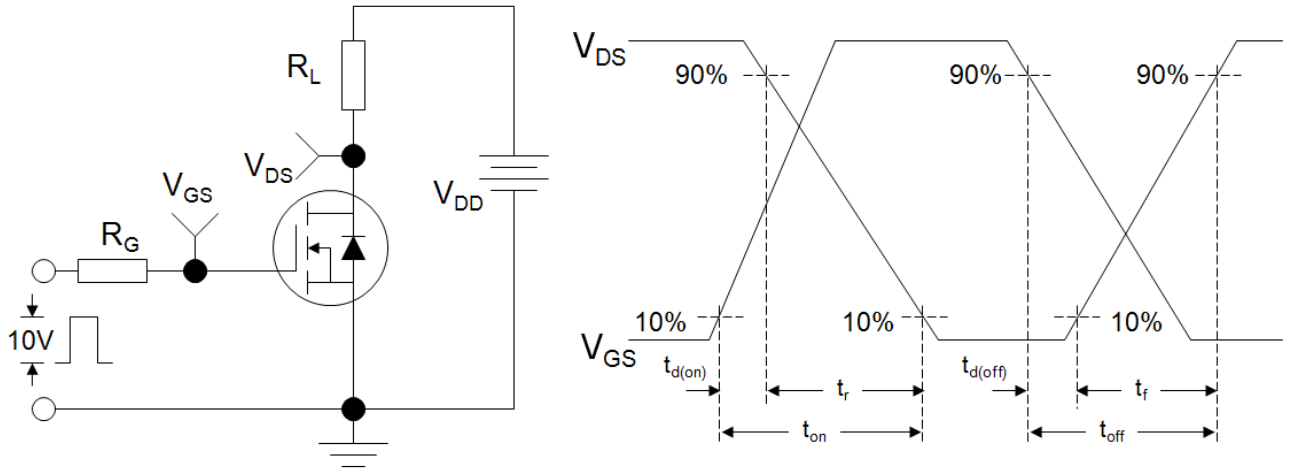
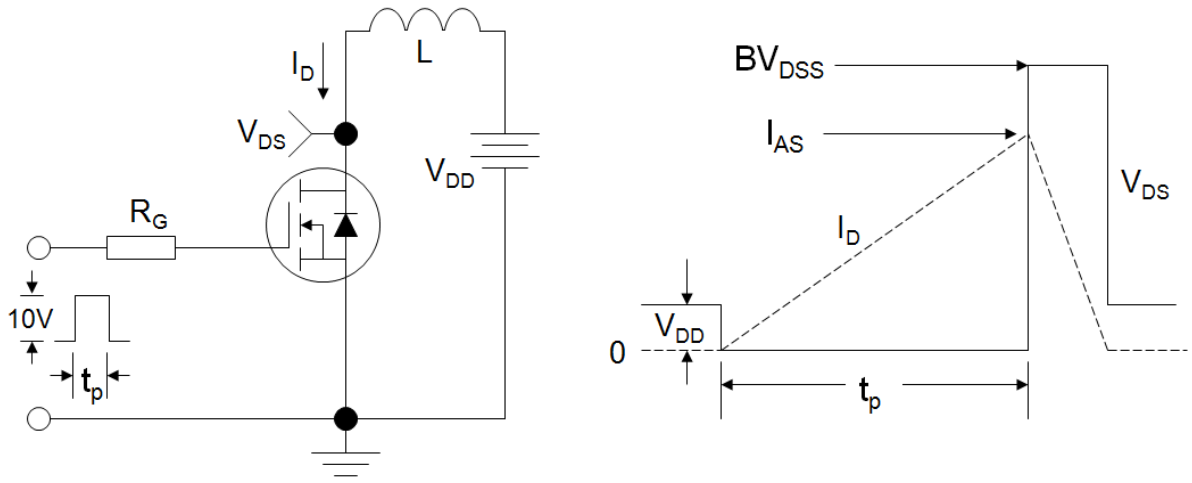
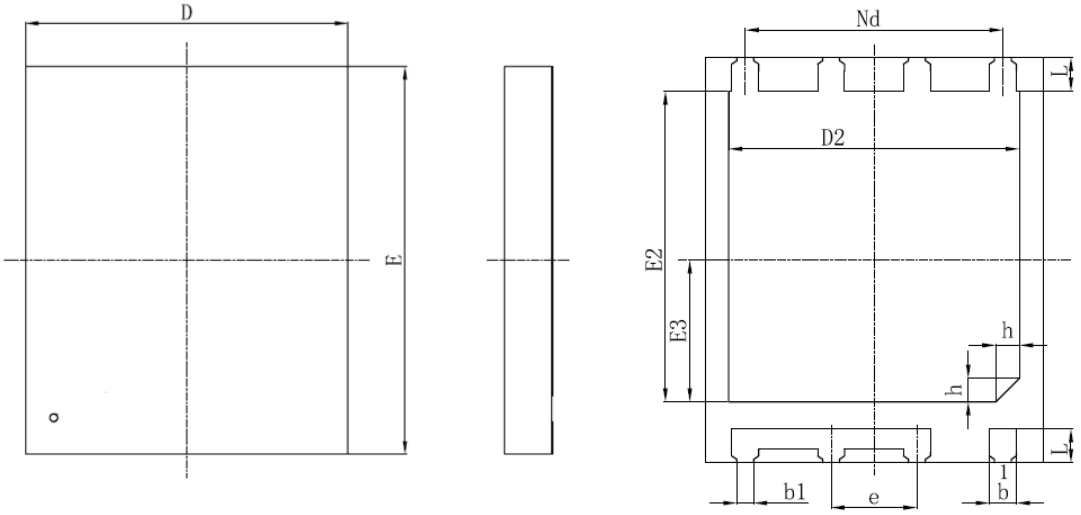
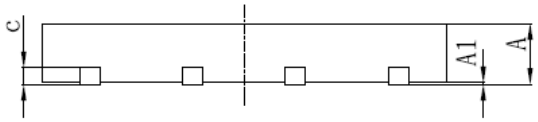



**Figure C：Unclamped Inductive Switching Test Circuit and Waveform**



# DFN5×6




| SYMBOL | MILLIMETER | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | 0.70 | 0.75 | 0.80 |
| A1 | 0 | 0.02 | 0.05 |
| b | 0.35 | 0.40 | 0.45 |
| b1 | 0.25REF | | |
| c | 0.18 | 0.203 | 0.25 |
| D | 4.90 | 5.00 | 5.10 |
| D2 | 4.20 | 4.30 | 4.40 |

| SYMBOL | MILLIMETER | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| Nd | 3.81BSC | | |
| e | 1.27BSC | | |
| E | 5.90 | 6.00 | 6.10 |
| E2 | 4.50 | 4.60 | 4.70 |
| E3 | 2.00 | 2.10 | 2.20 |
| L | 0.45 | 0.50 | 0.55 |
| h | 0.30 | 0.35 | 0.40 |

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