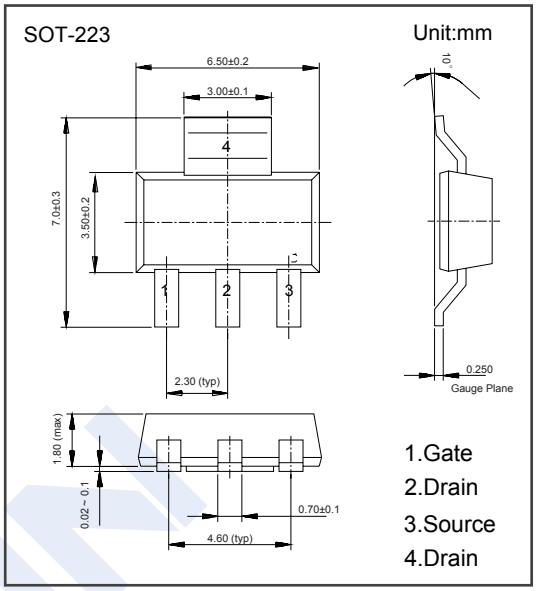
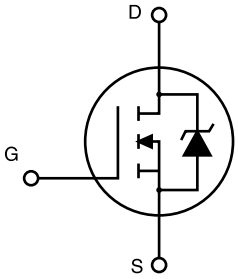
# N-Channel MOSFET
# NDT4N20L




## ■ Features

- $V_{DS\ (V)}$ = 200V
- $I_D$ = 1 A ($V_{GS}$ = 10V)
- $R_{DS(ON)}$ < 1.5Ω ($V_{GS}$ = 10V)
- $R_{DS(ON)}$ < 1.55Ω ($V_{GS}$ = 5V)
- Low gate charge




## ■ Absolute Maximum Ratings Ta = 25℃

| Parameter | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 200 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | |
| Continuous Drain Current | Tc=25℃ | $I_D$ | 1 | A |
| | Tc=70℃ | | 0.63 | |
| Pulsed Drain Current | | $I_{DM}$ | 4 | |
| Avalanche Current, Repetetive Or Not Repetetive | | $I_{AR}$ | 1 | |
| Power Dissipation | Tc=25℃ | $P_D$ | 3.3 | W |
| Single Pulse Avalanche Energy (Note.1) | | $E_{AS}$ | 90 | mJ |
| Peak Diode Recovery Voltage Slope (Note.2) | | dv/dt | 20 | V/ns |
| Thermal Resistance.Junction- to-Ambient (Note.3) | | $R_{thJA}$ | 62.5 | ℃/W |
| Thermal Resistance.Junction- to-Case (Note.4) | | $R_{thJC}$ | 38 | |
| Junction Temperature | | $T_J$ | 150 | ℃ |
| Storage Temperature Range | | $T_{stg}$ | -55 to 150 | |

Note.1:Starting Tj = 25 °C, $I_D$ = $I_{AR}$, $V_{DD}$ = 50 V.

Note.2: Isd ≤ 1 A, di/dt ≤ 200 A/μs, $V_{DD}$ ≤ 80% $V_{(BR)DSS}$.

Note.3: When mounted on 1 inch² FR-4 board, 2 oz. Cu, (t > 10 sec).

Note.4: When mounted on 1 inch² FR-4 board, 2 oz. Cu, (t < 10 sec).

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■ Electrical Characteristics Ta = 25℃

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $V_{DSS}$ | $I_D$=250μA, $V_{GS}$=0V | 200 | | | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=Max rating, $V_{GS}$=0V | | | 1 | uA |
| | | $V_{DS}$=Max rating, $V_{GS}$=0V, $T_J$=125℃ | | | 50 | |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{DS}$=0V, $V_{GS}$=±20V | | | ±100 | nA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$ , $I_D$=250μA | 1 | | 3 | V |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=0.5A | | | 1.5 | Ω |
| | | $V_{GS}$=5V, $I_D$=0.5A | | | 1.55 | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$=0V, $V_{DS}$=25V, f=1MHz | | 150 | | pF |
| Output Capacitance | $C_{oss}$ | | | 30 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 4 | | |
| Gate Resistance | $R_g$ | $V_{GS}$=0V, $V_{DS}$=0V, f=1MHz | | 5.5 | | Ω |
| Total Gate Charge | $Q_g$ | $V_{GS}$=10V, $V_{DS}$=160V, $I_D$=1A | | 0.9 | | nC |
| Gate Source Charge | $Q_{gs}$ | | | 2.6 | | |
| Gate Drain Charge | $Q_{gd}$ | | | 6.9 | | |
| Turn-On DelayTime | $t_{d(on)}$ | $V_{GS}$=10V, $V_{DS}$=100V, $I_D$=0.5A, $R_G$=4.7Ω | | 3.6 | | ns |
| Turn-On Rise Time | $t_r$ | | | 2 | | |
| Turn-Off DelayTime | $t_{d(off)}$ | | | 10.4 | | |
| Turn-Off Fall Time | $t_f$ | | | 15.4 | | |
| Reverse Recovery Time | $t_{rr}$ | $I_F$= 1A, $di/dt$= 100A/μs,$V_{DD}$=60V | | 51 | | |
| Reverse Recovery Charge | $Q_{rr}$ | | | 90 | | nC |
| Reverse Recovery Current | $I_{RRM}$ | | | 3.5 | | A |
| Reverse Recovery Time | $t_{rr}$ | $I_F$= 1A, $di/dt$= 100A/us,$V_{DD}$=60V, $T_J$=150℃ | | 56 | | ns |
| Reverse Recovery Charge | $Q_{rr}$ | | | 105 | | nC |
| Reverse Recovery Current | $I_{RRM}$ | | | 3.7 | | A |
| Source-Drain Current | $I_S$ | (Note.1) | | | 1 | |
| Source-Drain Current-Plused | $I_{SM}$ | (Note.1) | | | 4 | |
| Diode Forward Voltage | $V_{SD}$ | $I_S$=1A,$V_{GS}$=0V (Note.1) | | | 1.6 | V |

Note.1: Pulsed: pulse duration = 300 μs, duty cycle 1.5%

■ Marking

| Marking | 4N20L |
|---|---|

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■ Typical Characterisitics

Figure 1. Safe operating area

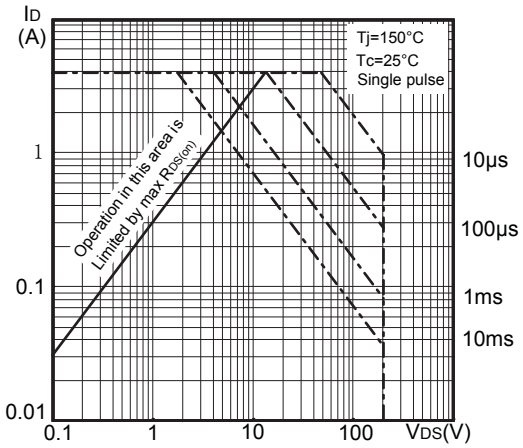



Figure 2. Thermal impedance

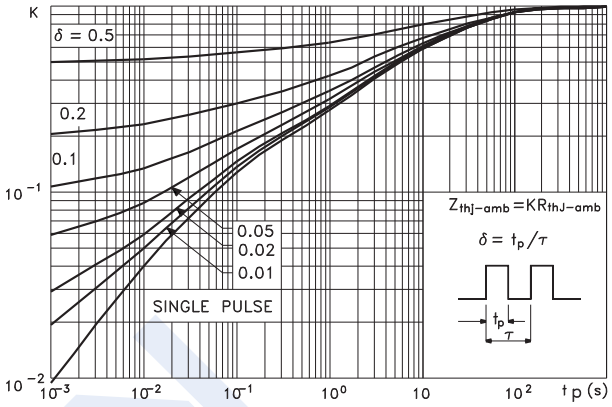



Figure 3. Output characteristics

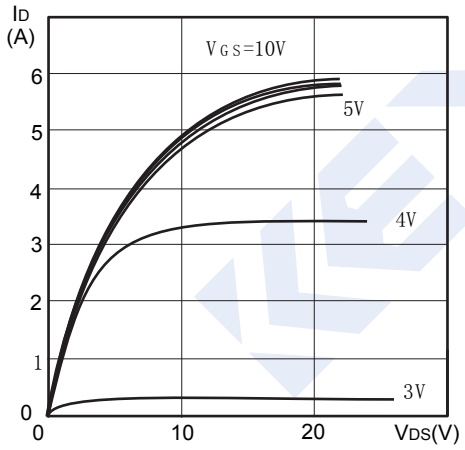



Figure 4. Transfer characteristics

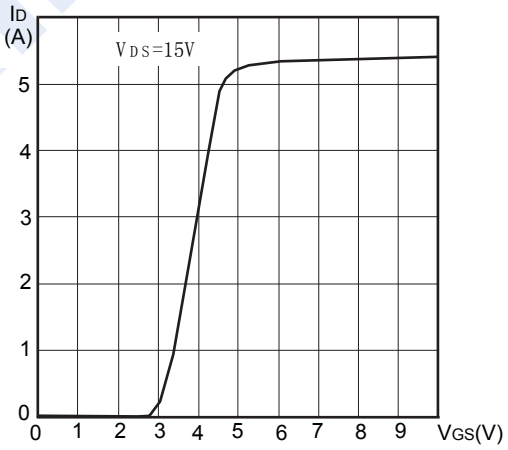



Figure 5. Normalized B $_{VDSS}$ vs temperature

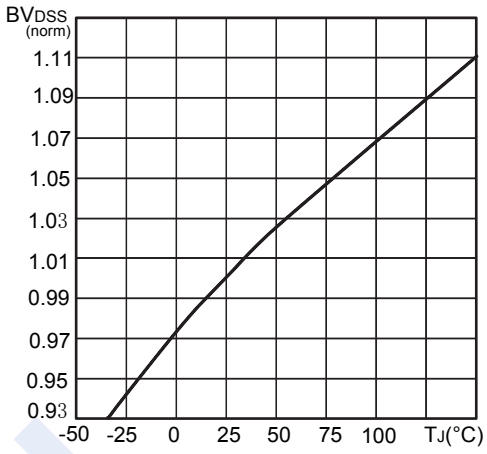
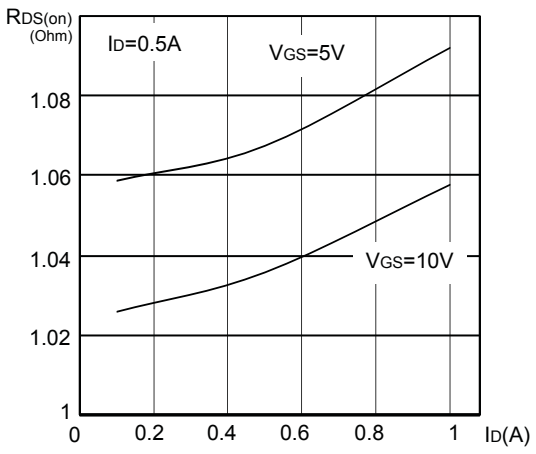



Figure 6. Static drain-source on resistance



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■ Typical Characterisitics

Figure 7. Gate charge vs gate-source voltage

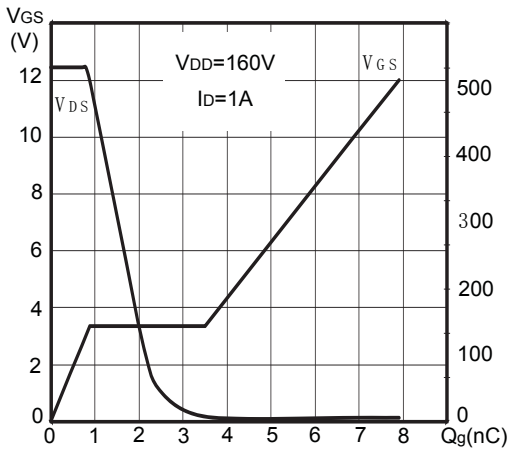



Figure 8. Capacitance variations

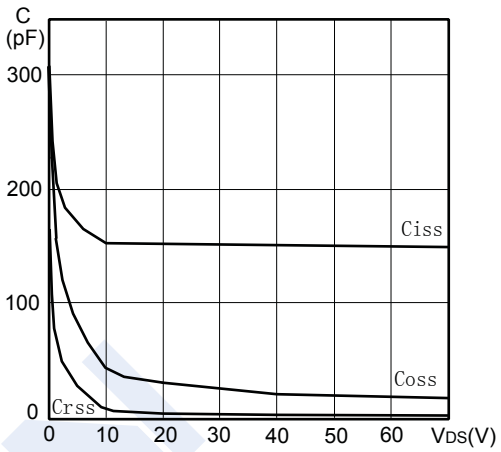



Figure 9. Normalized gate threshold voltage vs temperature

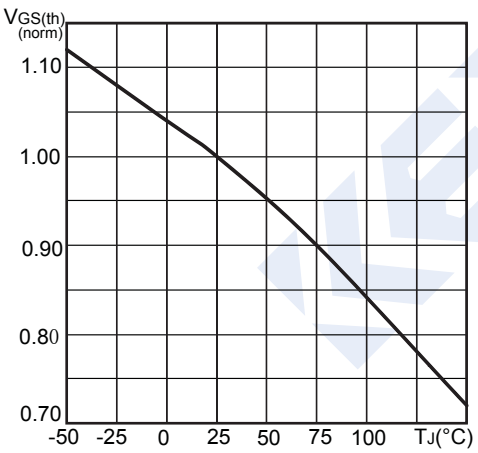



Figure 10. Normalized on resistance vs temperature

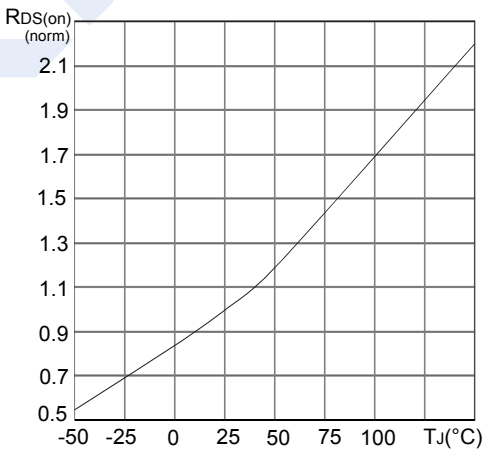



Figure 11. Switching times test circuit for resistive load

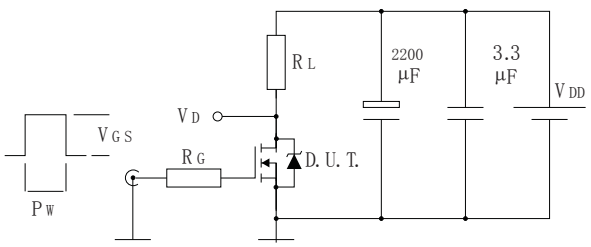
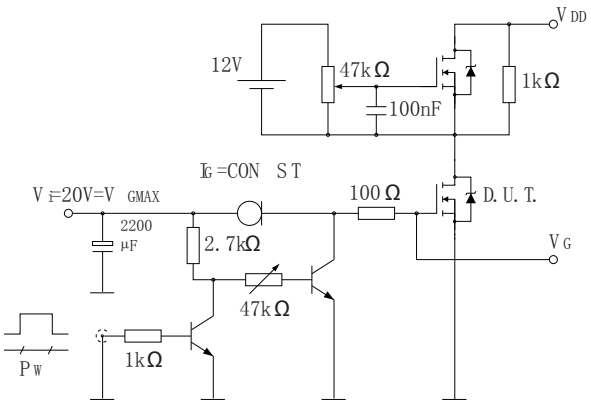



Figure 12. Gate charge test circuit



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■ Typical Characterisitics

Figure 13. Test circuit for inductive load switching and diode recovery times

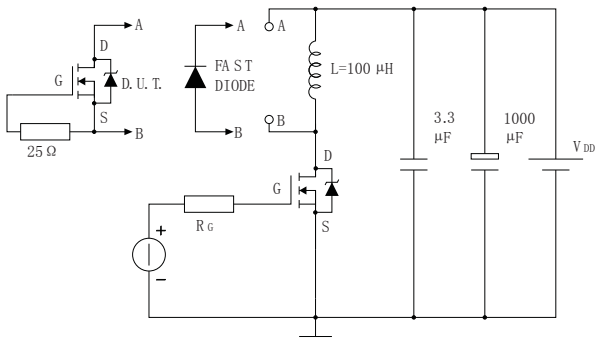


Figure 14. Unclamped inductive load test circuit

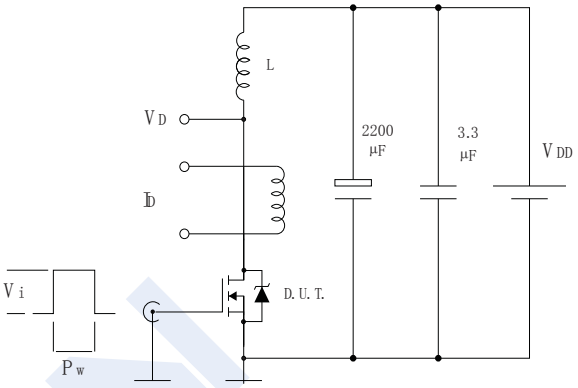


Figure 15. Unclamped inductive wavefor m

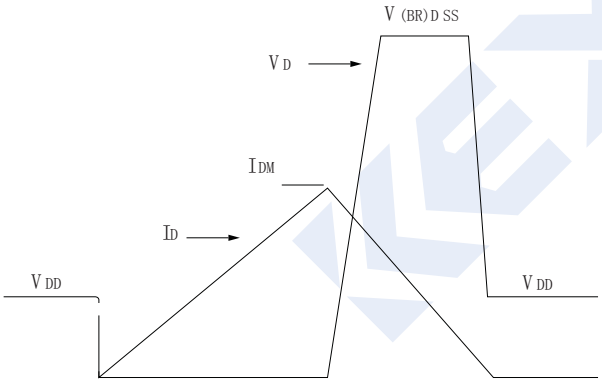


Figure 16. Switching time waveform