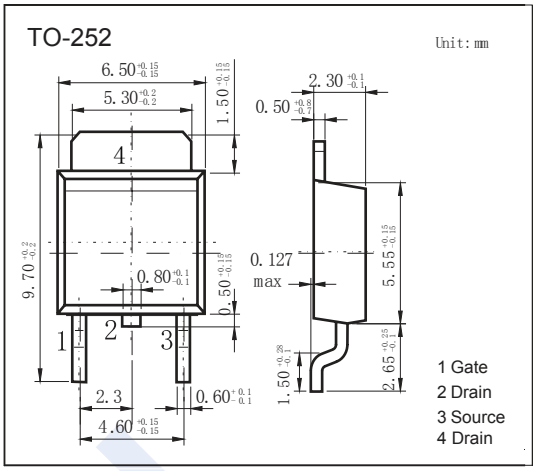
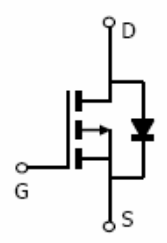
# P-Channel MOSFET
# NDT40P04




## ■ Features

- $V_{DS}$ (V) =-40V
- $I_D$ =-40 A ($V_{GS}$ =-10V)
- $R_{DS(ON)}$ < 14mΩ ($V_{GS}$ =-10V)
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high $E_{AS}$




## ■ Absolute Maximum Ratings Ta = 25℃

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | -40 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | |
| Continuous Drain Current Tc=25℃ | $I_D$ | -40 | A |
| | | -25 | |
| Pulsed Drain Current | $I_{DM}$ | -50 | |
| Power Dissipation | $P_D$ | 80 | W |
| Derating factor | | 0.53 | W/℃ |
| Single Pulse Avalanche Energy (Note.1) | $E_{AS}$ | 544 | mJ |
| Thermal Resistance.Junction- to-Case | $R_{thJC}$ | 1.88 | ℃/W |
| Junction Temperature | $T_J$ | 175 | ℃ |
| Junction Storage Temperature Range | $T_{stg}$ | -55 to 175 | |

Note.1:EAS condition: $T_j$=25℃,$V_{DD}$=-20V,$V_G$=-10V,L=1mH,$R_g$=25Ω,$I_{AS}$=33A

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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 | -40 | | | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=-40V, $V_{GS}$=0V | | | -1 | μA |
| 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 | -1.5 | | -3 | V |
| Static Drain-Source On-Resistance | $R_{DS(on)}$ | $V_{GS}$=-10V, $I_D$=-12A | | | 14 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=-5V, $I_D$=-12A | 34 | | | S |
| Input Capacitance | $C_{iss}$ | $V_{GS}$=0V, $V_{DS}$=-20V, f=1MHz | | 2960 | | pF |
| Output Capacitance | $C_{oss}$ | | | 370 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 310 | | |
| Total Gate Charge | $Q_g$ | $V_{GS}$=-10V, $V_{DS}$=-20V, $I_D$=-12A | | 12 | | nC |
| Gate Source Charge | $Q_{gs}$ | | | 14 | | |
| Gate Drain Charge | $Q_{gd}$ | | | 15 | | |
| Turn-On DelayTime | $t_{d(on)}$ | $V_{DD}$=-20V,$I_D$=-20A $V_{GS}$=-10V,$R_G$=3Ω | | 10 | | ns |
| Turn-On Rise Time | $t_r$ | | | 18 | | |
| Turn-Off DelayTime | $t_{d(off)}$ | | | 38 | | |
| Turn-Off Fall Time | $t_f$ | | | 24 | | |
| Body Diode Reverse Recovery Time | $t_{rr}$ | $I_F$=-20A, di/dt=100A/us,$T_J$=25℃ | | 40 | | |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | | | 42 | | nC |
| Maximum Body-Diode Continuous Current | $I_S$ | | | | -40 | A |
| Diode Forward Voltage | $V_{SD}$ | $I_S$=-20A,$V_{GS}$=0V | | | -1.2 | V |

Note : Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.

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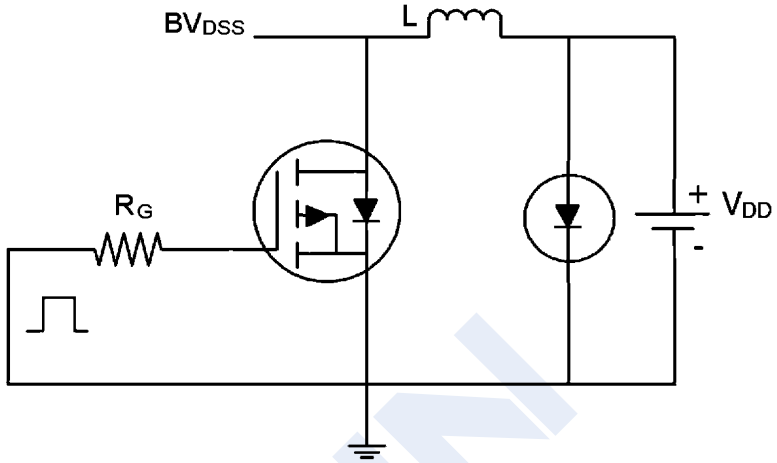
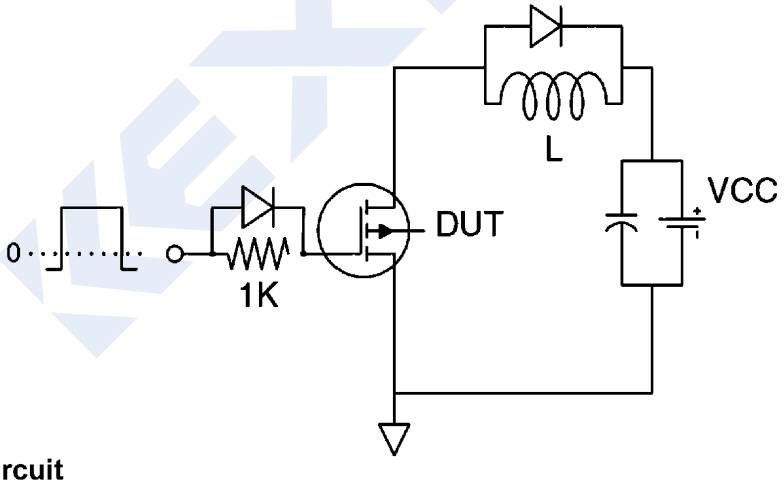
■ Test Circuit

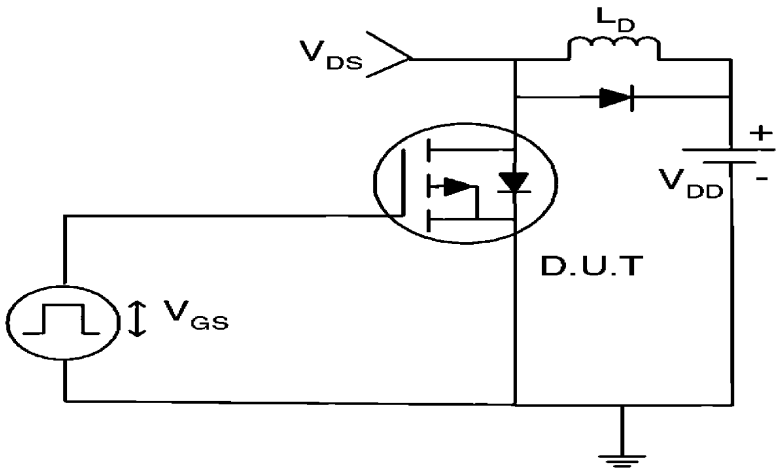
**1) $E_{AS}$ Test Circuit**




**2) Gate Charge Test Circuit**




**3) Switch Time Test Circuit**



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■ Typical Characterisitics

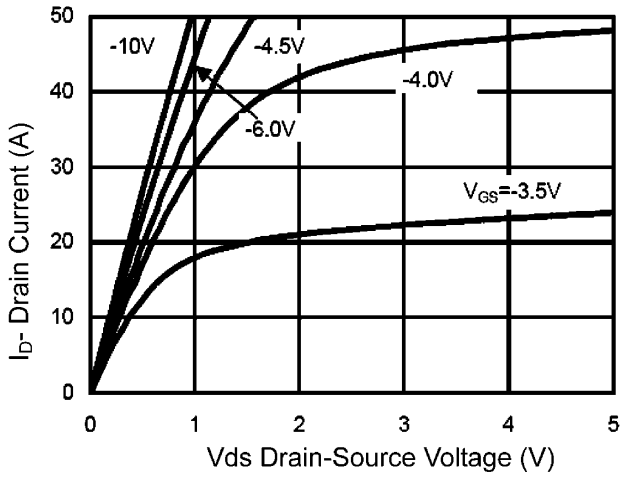


**Figure 1 Output Characteristics**

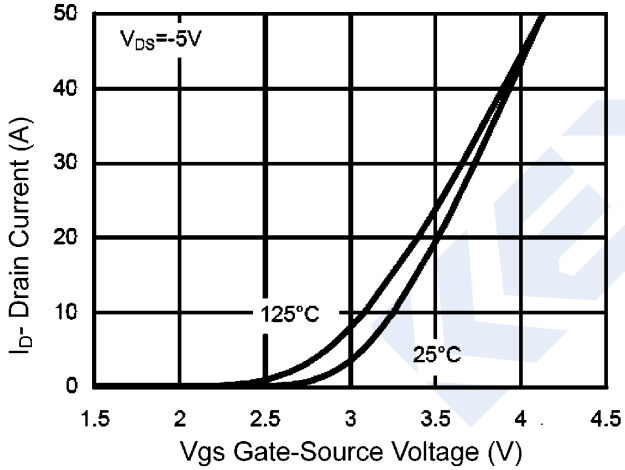


**Figure 2 Transfer Characteristics**

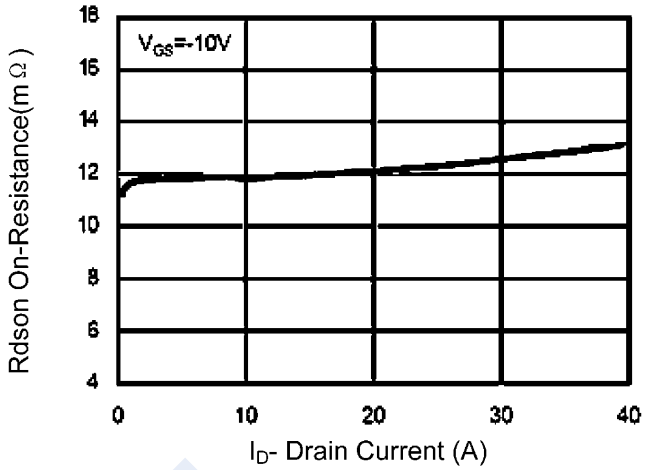


**Figure 3 Rdson- Drain Current**

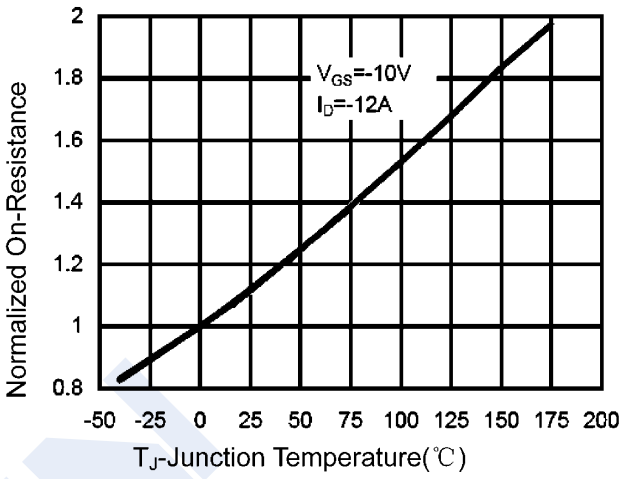


**Figure 4 Rdson-Junction Temperature**

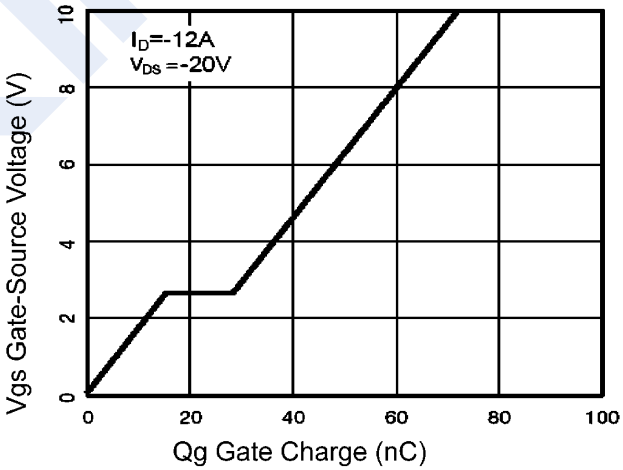


**Figure 5 Gate Charge**

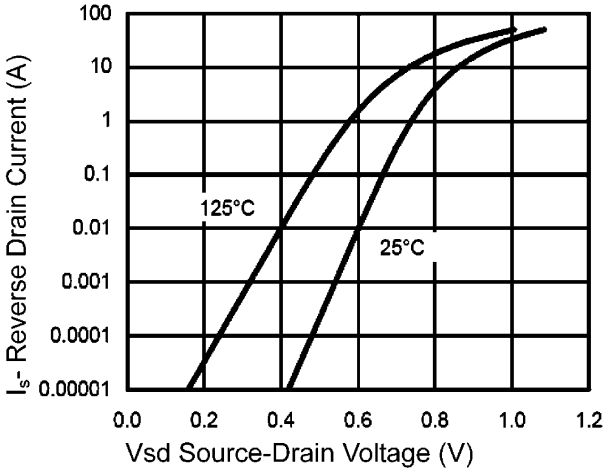


**Figure 6 Source- Drain Diode Forward**

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■ Typical Characterisitics

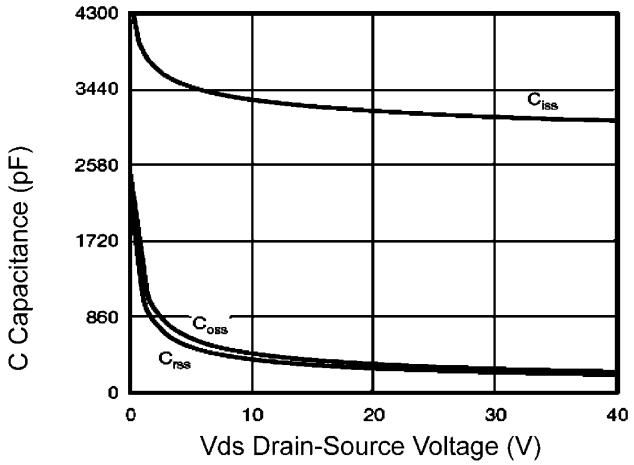


**Figure 7 Capacitance vs Vds**

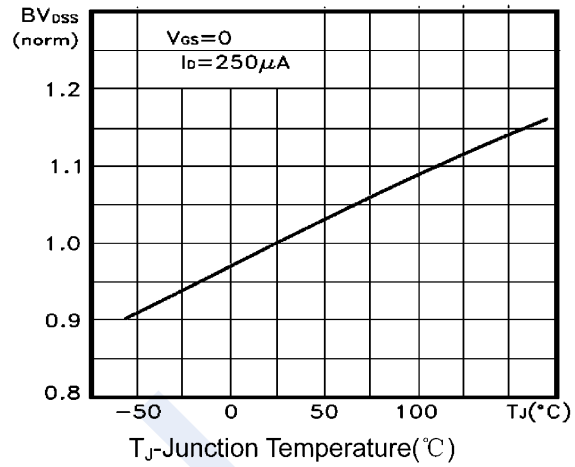


**Figure 9 $BV_{DSS}$ vs Junction Temperature**

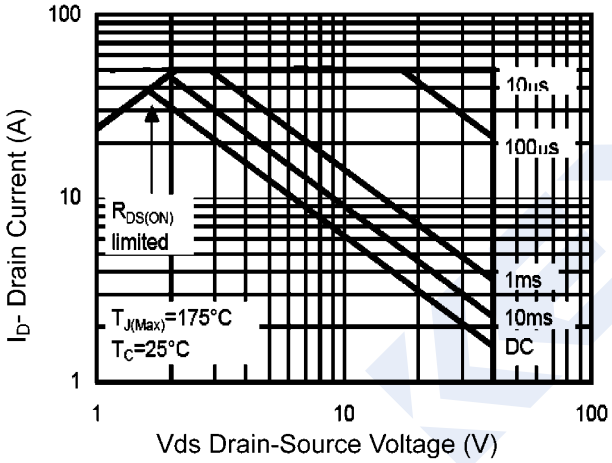


**Figure 8 Safe Operation Area**

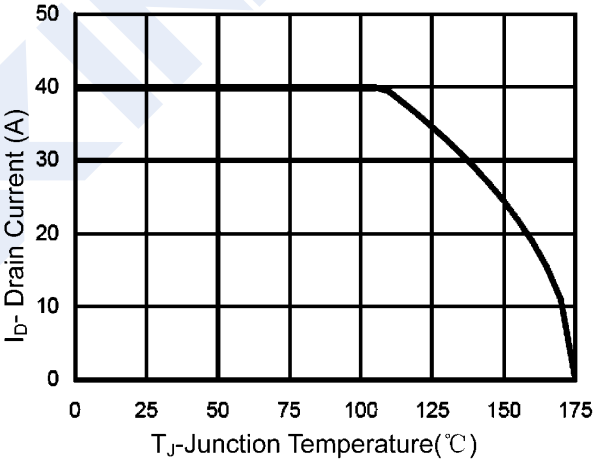


**Figure 10 ID Current Derating vs Junction Temperature**

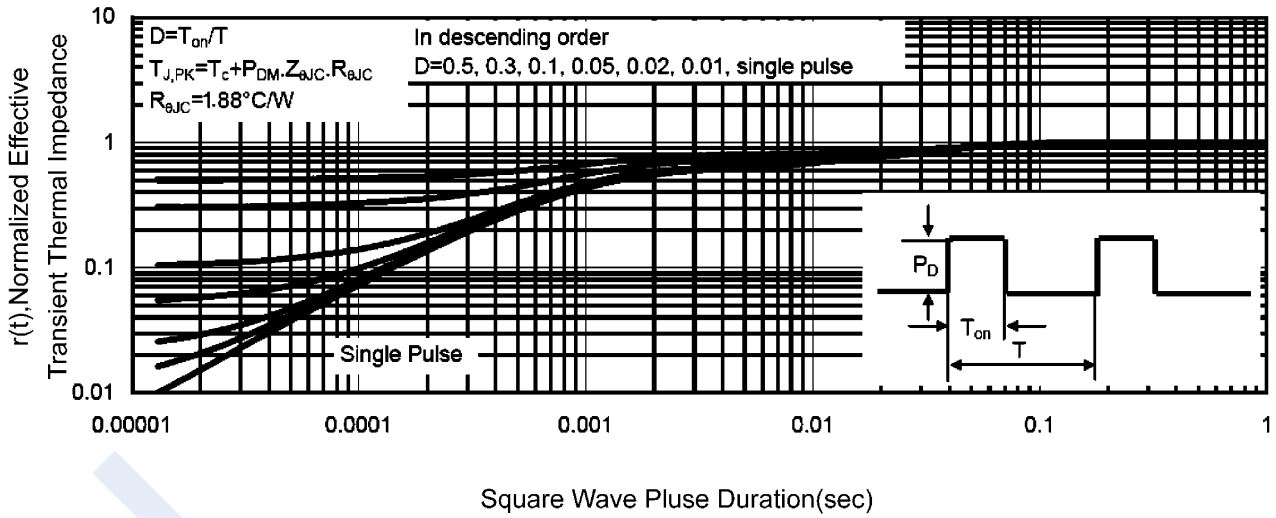


**Figure 11 Normalized Maximum Transient Thermal Impedance**