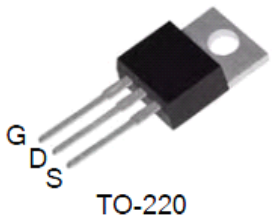
## Description

### Features

| $V_{DSS}$ | $R_{DS(ON)}$ @10V (typ) | $I_D$ |
|---|---|---|
| 55V | 6.8mΩ | 110A |

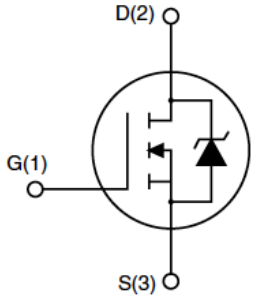
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



TO-220

### Application

- UPS
- High efficiency switch mode power supplies




## Absolute Maximum Ratings $T_C$=25℃ unless otherwise specified

| Symbol | Parameter | | Max. TO-220 | Units |
|---|---|---|---|---|
| $V_{DSS}$ | Drain-Source Voltage | | 55 | V |
| $V_{GSS}$ | Gate-Source Voltage | | ± 20 | V |
| $I_D$ | Continuous Drain Current | $T_C$ = 25℃ | 110 note5 | A |
| | | $T_C$ = 100℃ | 80 | A |
| $I_{DM}$ | Pulsed Drain Current note1 | | 390 | A |
| $I_{AR}$ | Avalanche Current note1 | | 60 | A |
| $E_{AR}$ | Repetitive Avalanche Energy note1 | | 20 | mJ |
| dv/dt | Peak Diode Recovery Energy note3 | | 5.0 | V/ns |
| $P_D$ | Power Dissipation | $T_C$ = 25℃ | 200 | W |
| | Linear Derating Factor | $T_C$ > 25℃ | 1.3 | W/℃ |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | | 0.75 | ℃/W |
| $T_J$, $T_{STG}$ | Operating and Storage Temperature Range | | -55 to +175 | ℃ |

*Drain current limited by maximum junction temperature

## Electrical Characteristics $T_C$=25℃ unless otherwise specified

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| **Off Characteristic** | | | | | | |
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$ = 0V,$I_D$ = 250μA | 55 | - | - | V |
| $\triangle V_{(BR)DSS}$ /$\triangle T_J$ | Breakdown Voltage Temperature Coefficient | Reference to 25℃, $I_D$ = 250μA | - | 0.057 | - | V/℃ |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 55V, $V_{GS}$ = 0V | - | - | 1 | μA |
| | | $V_{DS}$ = 44V, $T_C$ = 125℃ | - | - | 10 | μA |
| $I_{GSS}$ | Gate to Body Leakage Current | $V_{DS}$ = 0V, $V_{GS}$ = ±20V | - | - | ±100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage note4 | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 2 | - | 4 | V |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance | $V_{GS}$ =10V, $I_D$ = 60A | - | 6.8 | 8.0 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ =20V, $I_D$ = 60A | 45 | - | - | S |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 25V, $V_{GS}$ = 0V, f = 1.0MHz | - | 3291 | - | pF |
| $C_{oss}$ | Output Capacitance | | - | 671.5 | - | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 112.1 | - | pF |
| $Q_g$ | Total Gate Charge | $V_{DD}$ = 44V, $I_D$ = 60A, $V_{GS}$ = 10V | - | 112 | - | nC |
| $Q_{gs}$ | Gate-Source Charge | | - | 23.2 | - | nC |
| $Q_{gd}$ | Gate-Drain(“Miller”) Charge | | - | 34.9 | - | nC |
| $E_{AS}$ | Single Pulse Avalanche Energy note2 | $I_{AS}$ = 20A, L = 5mH | - | 1000 note6 | 267 note7 | mJ |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD}$ = 28V, $I_D$ = 60A, $R_G$ = 5Ω, $V_{GS}$ = 10V | - | 19.5 | - | ns |
| $t_r$ | Turn-On Rise Time | | - | 50.7 | - | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 55 | - | ns |
| $t_f$ | Turn-Off Fall Time | | - | 24.6 | - | ns |
| **Drain-Source Diode Characteristics and Maximum Ratings** | | | | | | |
| $I_S$ | Maximum Continuous Drain to Source Diode Forward Current | | - | - | 110 | A |
| $I_{SM}$ | Maximum Pulsed Drain to Source Diode Forward Current | | - | - | 390 | A |
| $V_{SD}$ | Drain to Source Diode Forward Voltage | $V_{GS}$ = 0V, $I_S$ = 60A | - | - | 1.3 | V |
| $t_{rr}$ | Reverse Recovery Time | $V_{GS}$ = 0V, $I_F$ = 60A, di/dt =100A/μs | - | 62.3 | - | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | - | 137 | - | nC |

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 5mH, $I_{AS}$ = 20A, $V_{DD}$ = 50V, $R_G$ = 25Ω, Starting $T_J$ = 25℃
3. $I_{SD}$ ≤ 60A, di/dt ≤ 200A/μs, $V_{DD}$ ≤ $B_{VDSS}$, Starting $T_J$ = 25℃
4. Pulse width ≤ 300μs; duty cycle ≤ 2%.
5. Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 75A.
6. This is a typical value at device destruction and represents operation outside rated limits.
7. This is a calculated value limited to TJ = 175℃.

## Typical Performance Characteristics

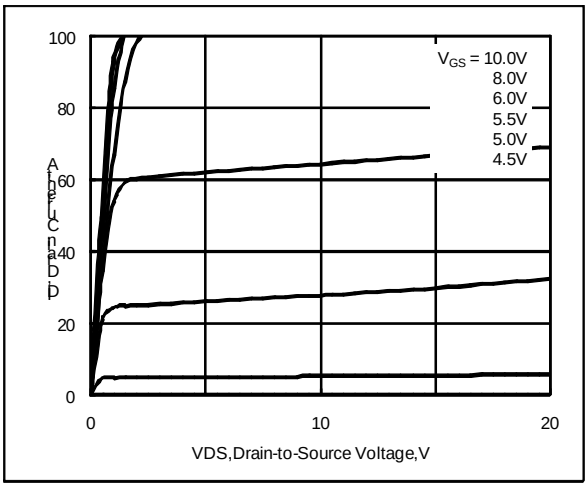



**Figure 1. Output Characteristics**

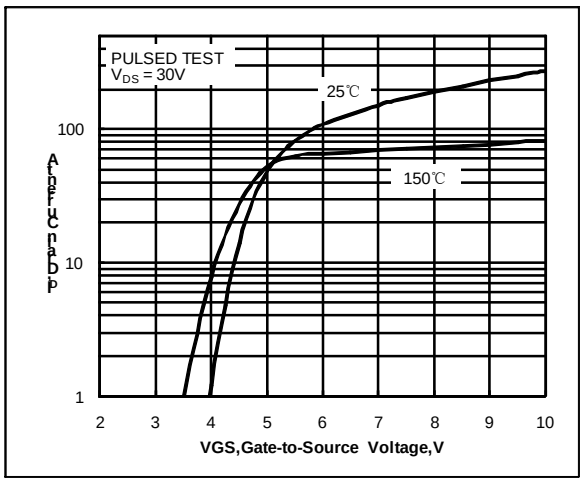



**Figure 2. Transfer Characteristics**

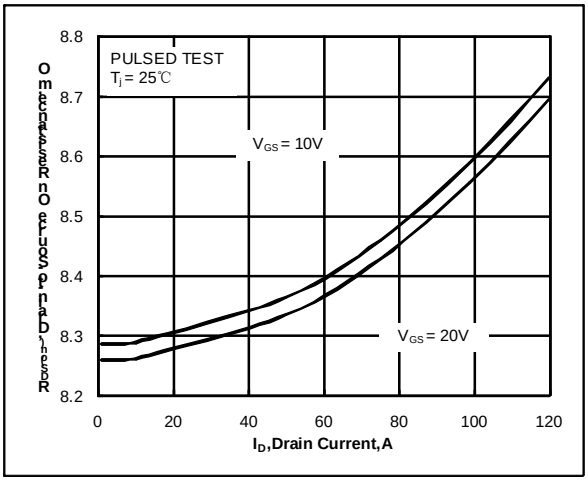



**Figure 3. Drain-to-Source On Resistance vs. Drain Current and Gate Voltage**

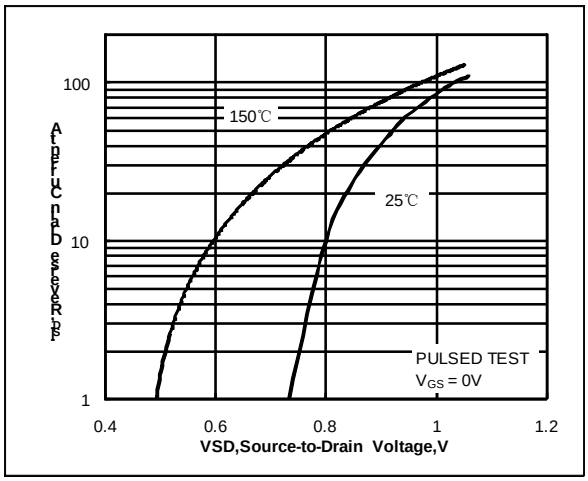
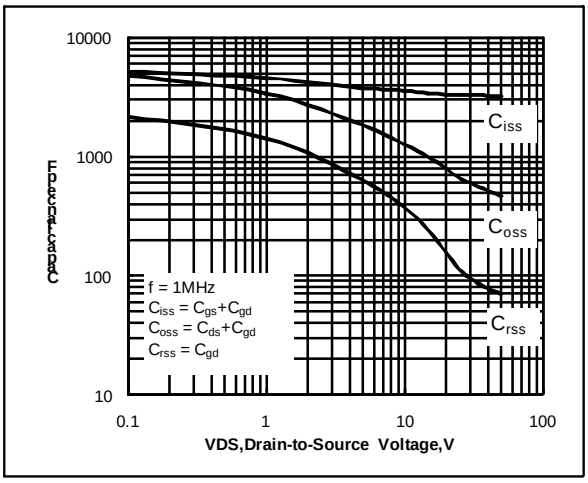



**Figure 4. Body Diode Forward Voltage vs. Source Current and Temperature**




**igure 5. Capacitance Characteristics**

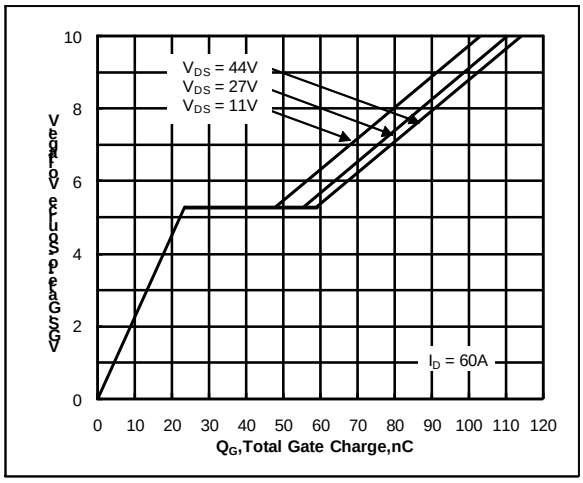



**Figure 6. Gate Charge Characteristics**

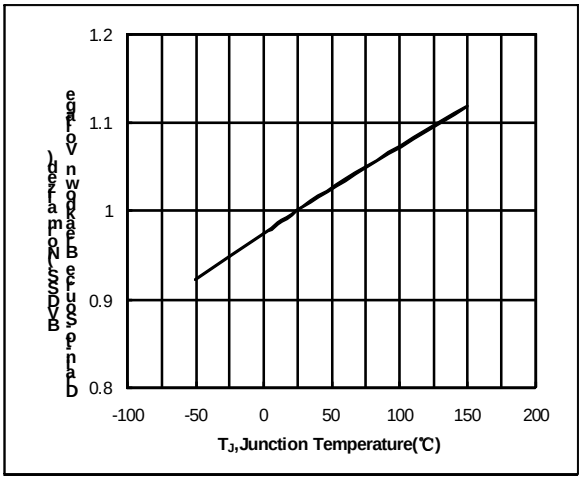



Figure 7. Normalized Breakdown Voltage vs. Junction Temperature

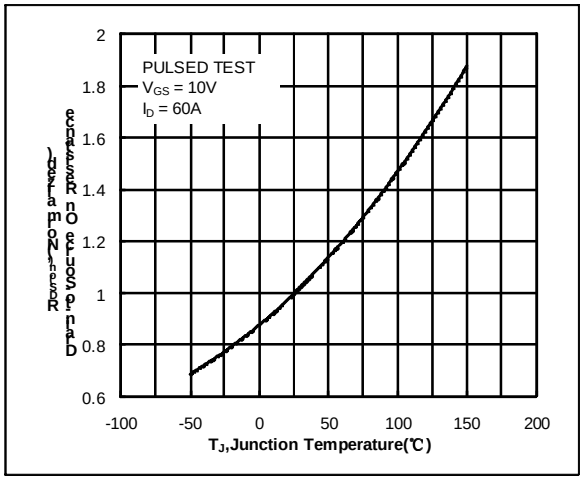



Figure 8. Normalized On Resistance vs. Junction Temperature

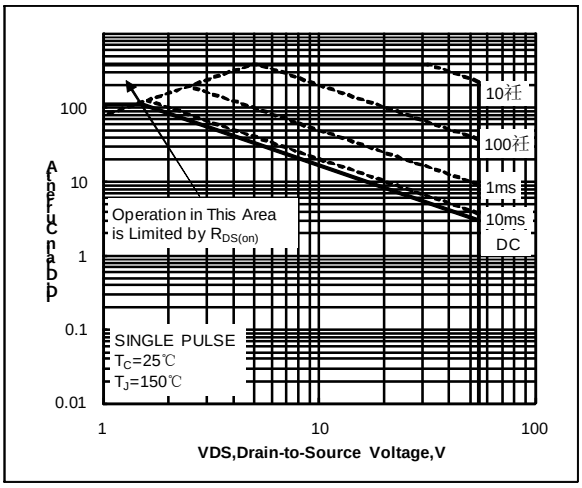



Figure 9. Maximum Safe Operating Area for OP3205B

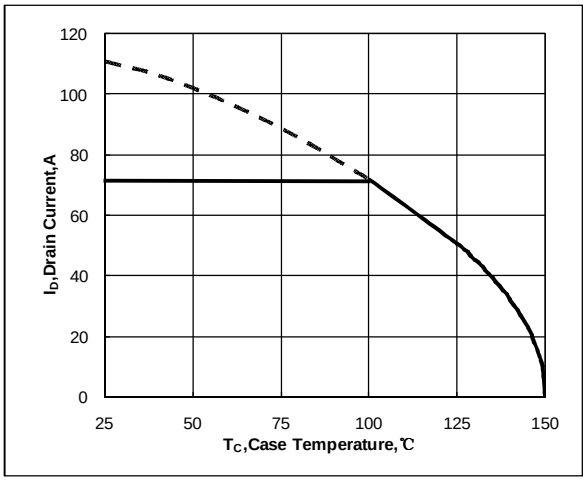



Figure 10. Maximum Continuous Drain Current vs. Case Temperature

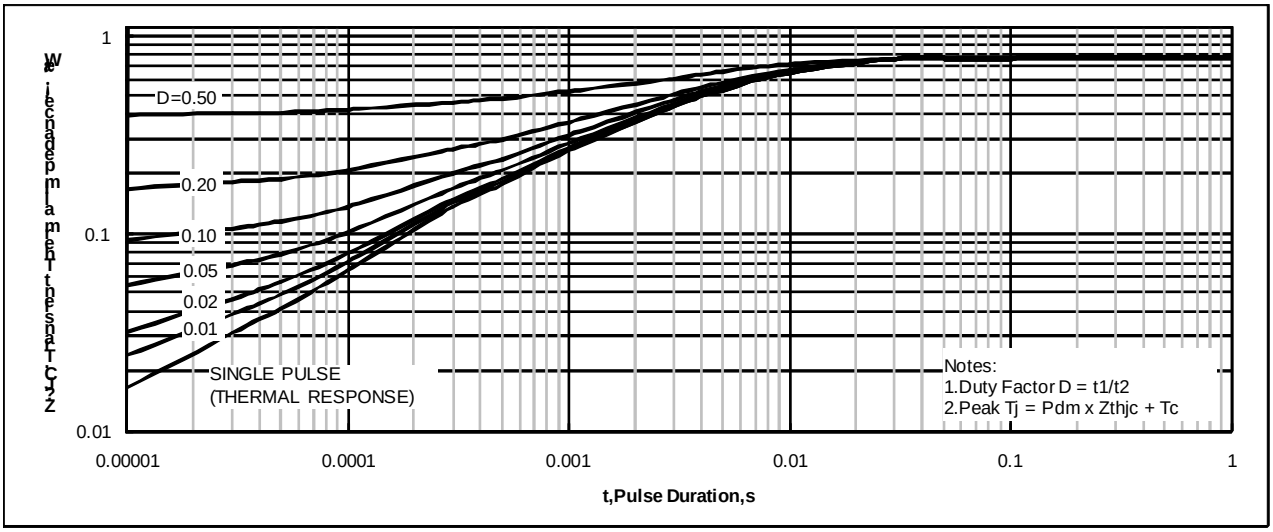



Figure 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case for OP3205B

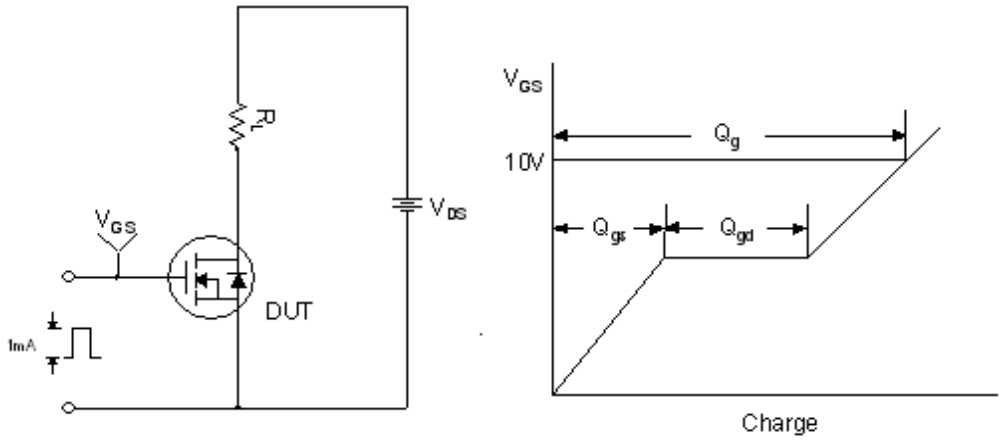



**Figure 12. Gate Charge Test Circuit & Waveform**

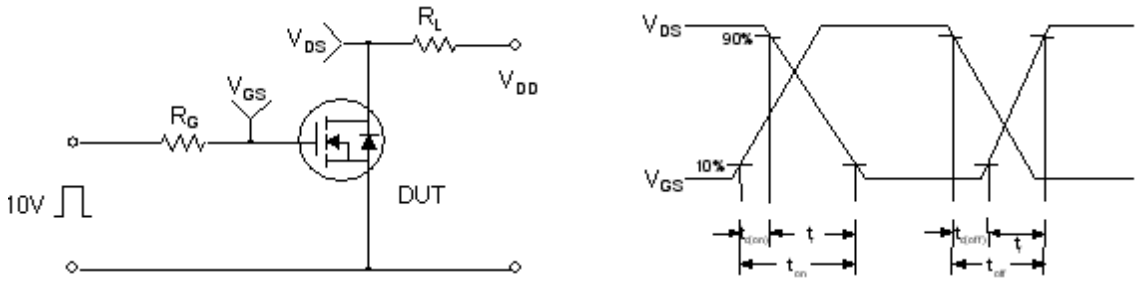



**Figure 13. Resistive Switching Test Circuit & Waveforms**

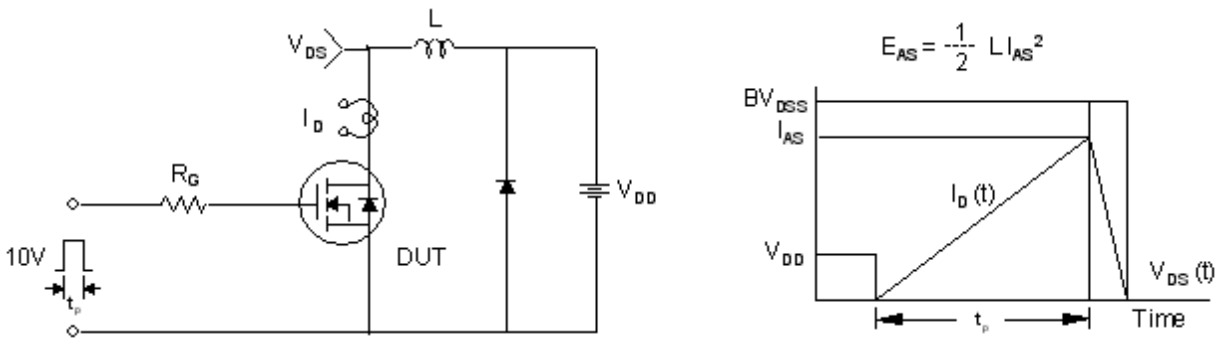
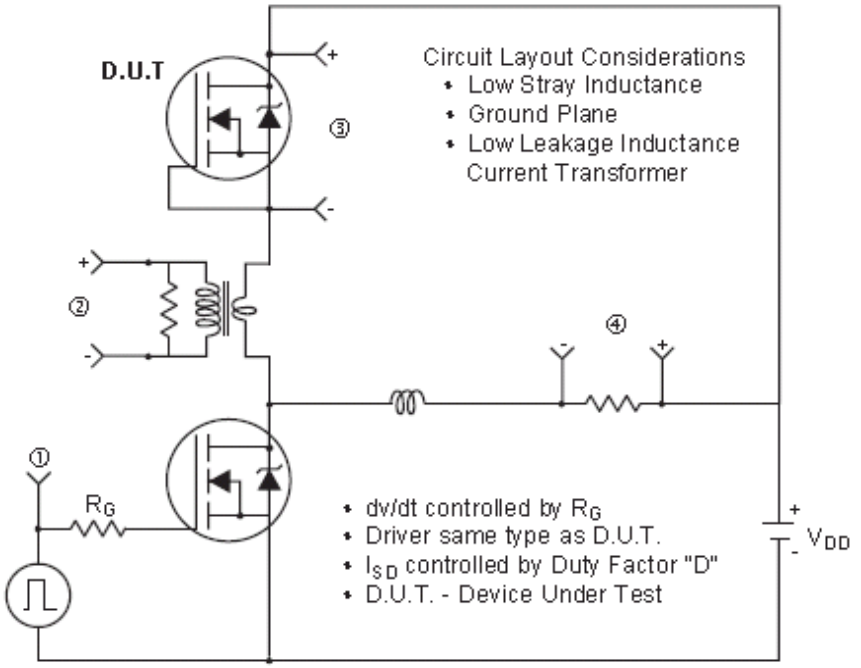



**Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms**



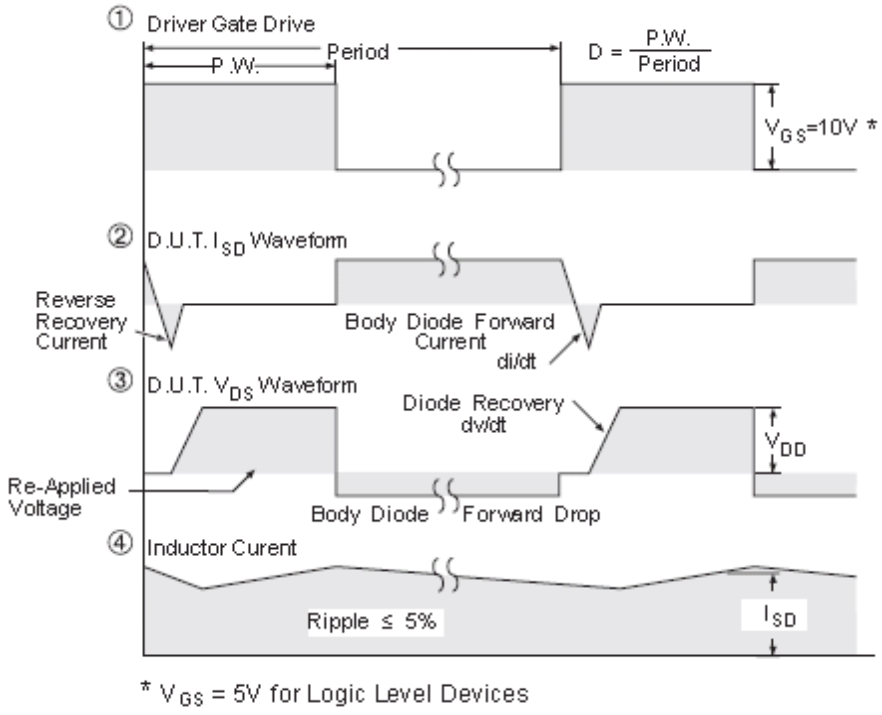




**Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms (For N-channel)**

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