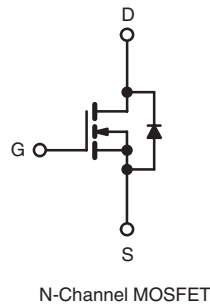
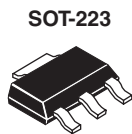


Power MOSFET

| PRODUCT SUMMARY | | |
|---------------------------|------------------|------|
| V_{DS} (V) | 60 | |
| $R_{DS(on)}$ (Ω) | $V_{GS} = 5.0$ V | 0.20 |
| Q_g (Max.) (nC) | 8.4 | |
| Q_{gs} (nC) | 3.5 | |
| Q_{gd} (nC) | 6.0 | |
| Configuration | Single | |



FEATURES

- Surface Mount
- Available in Tape and Reel
- Dynamic dV/dt Rating
- Logic-Level Gate Drive
- $R_{DS(on)}$ Specified at $V_{GS} = 4$ V and 5 V
- Fast Switching
- Ease of Paralleling
- Lead (Pb)-free Available



Available
RoHS*
COMPLIANT

DESCRIPTION

Third generation Power MOSFETs from Vishay provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The SOT-223 package is designed for surface-mounting using vapor phase, infrared, or wave soldering techniques. Its unique package design allows for easy automatic pick-and-place as with other SOT or SOIC packages but has the added advantage of improved thermal performance due to an enlarged tab for heatsinking. Power dissipation of greater than 1.25 W is possible in a typical surface mount application.

| ORDERING INFORMATION | | |
|----------------------|-------------|---------------------------|
| Package | SOT-223 | SOT-223 |
| Lead (Pb)-free | IRLL014PbF | IRLL014TRPbF ^a |
| | SiHLL014-E3 | SiHLL014T-E3 ^a |
| SnPb | IRLL014 | IRLL014TR ^a |
| | SiHLL014 | SiHLL014T ^a |

Note

a. See device orientation.

| ABSOLUTE MAXIMUM RATINGS $T_C = 25$ °C, unless otherwise noted | | | |
|--|------------------|------------------|------|
| PARAMETER | SYMBOL | LIMIT | UNIT |
| Drain-Source Voltage | V_{DS} | 60 | V |
| Gate-Source Voltage | V_{GS} | ± 10 | |
| Continuous Drain Current | V_{GS} at 10 V | $T_C = 25$ °C | A |
| | | $T_C = 100$ °C | |
| Pulsed Drain Current ^a | I_{DM} | 22 | |
| Linear Derating Factor | | 0.025 | W/°C |
| Linear Derating Factor (PCB Mount) ^e | | 0.017 | |
| Single Pulse Avalanche Energy ^b | E_{AS} | 100 | mJ |
| Repetitive Avalanche Current ^a | I_{AR} | 2.7 | A |
| Repetitive Avalanche Energy ^a | E_{AR} | 0.31 | mJ |
| Maximum Power Dissipation | P_D | $T_C = 25$ °C | 3.1 |
| Maximum Power Dissipation (PCB Mount) ^e | | $T_A = 25$ °C | 2.0 |
| Peak Diode Recovery dV/dt ^c | dV/dt | 4.5 | V/ns |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | - 55 to + 150 | °C |
| Soldering Recommendations (Peak Temperature) | for 10 s | 300 ^d | |

Notes



- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = 25$ V, starting $T_J = 25$ °C, $L = 16$ mH, $R_G = 25$ Ω , $I_{AS} = 2.7$ A (see fig. 12).
- $I_{SD} \leq 10$ A, $dI/dt \leq 90$ A/ μ s, $V_{DD} \leq V_{DS}$, $T_J \leq 150$ °C.
- 1.6 mm from case.
- When mounted on 1" square PCB (FR-4 or G-10 material).

* Pb containing terminations are not RoHS compliant, exemptions may apply

| THERMAL RESISTANCE RATINGS | | | | | | |
|--|------------|------|------|------|------|--|
| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | |
| Maximum Junction-to-Ambient (PCB Mount) ^a | R_{thJA} | - | - | 60 | °C/W | |
| Maximum Junction-to-Case (Drain) | R_{thJC} | - | - | 40 | | |

Note

a. When mounted on 1" square PCB (FR-4 or G-10 material).

| SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted | | | | | | | |
|--|---------------------|--|--|------|-------|-----------|---------------|
| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN. | TYP. | MAX. | UNIT |
| Static | | | | | | | |
| Drain-Source Breakdown Voltage | V_{DS} | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ | | 60 | - | - | V |
| V_{DS} Temperature Coefficient | $\Delta V_{DS}/T_J$ | Reference to $25\text{ }^\circ\text{C}$, $I_D = 1\text{ mA}$ | | - | 0.073 | - | V/°C |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$ | | 1.0 | - | 2.0 | V |
| Gate-Source Leakage | I_{GSS} | $V_{GS} = \pm 10\text{ V}$ | | - | - | ± 100 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$ | | - | - | 25 | μA |
| | | $V_{DS} = 48\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$ | | - | - | 250 | |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | $V_{GS} = 5.0\text{ V}$ | $I_D = 1.6\text{ A}^b$ | - | - | 0.20 | Ω |
| | | $V_{GS} = 4.0\text{ V}$ | $I_D = 1.4\text{ A}^b$ | - | - | 0.28 | |
| Forward Transconductance | g_{fs} | $V_{DS} = 25\text{ V}, I_D = 1.6\text{ A}$ | | 3.2 | - | - | S |
| Dynamic | | | | | | | |
| Input Capacitance | C_{iss} | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1.0\text{ MHz}$, see fig. 5 | | - | 400 | - | pF |
| Output Capacitance | C_{oss} | | | - | 170 | - | |
| Reverse Transfer Capacitance | C_{rss} | | | - | 42 | - | |
| Total Gate Charge | Q_g | $V_{GS} = 5.0\text{ V}$ | $I_D = 10\text{ A}, V_{DS} = 48\text{ V}$, see fig. 6 and 13 ^b | - | - | 8.4 | nC |
| Gate-Source Charge | Q_{gs} | | | - | - | 3.5 | |
| Gate-Drain Charge | Q_{gd} | | | - | - | 6.0 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = 30\text{ V}, I_D = 10\text{ A}, R_G = 12\text{ }\Omega, R_D = 2.8\text{ }\Omega$, see fig. 10 ^b | | - | 9.3 | - | ns |
| Rise Time | t_r | | | - | 110 | - | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | - | 17 | - | |
| Fall Time | t_f | | | - | 26 | - | |
| Internal Drain Inductance | L_D | Between lead, 6 mm (0.25") from package and center of die contact  | | - | 4.0 | - | nH |
| Internal Source Inductance | L_S | | | - | 6.0 | - | |
| Drain-Source Body Diode Characteristics | | | | | | | |
| Continuous Source-Drain Diode Current | I_S | MOSFET symbol showing the integral reverse p - n junction diode  | | - | - | 2.7 | A |
| Pulsed Diode Forward Current ^a | I_{SM} | | | - | - | 22 | |
| Body Diode Voltage | V_{SD} | $T_J = 25\text{ }^\circ\text{C}, I_S = 2.7\text{ A}, V_{GS} = 0\text{ V}^b$ | | - | - | 1.6 | V |
| Body Diode Reverse Recovery Time | t_{rr} | $T_J = 25\text{ }^\circ\text{C}, I_F = 10\text{ A}, di/dt = 100\text{ A}/\mu\text{s}^b$ | | - | 65 | 130 | ns |
| Body Diode Reverse Recovery Charge | Q_{rr} | | | - | 0.33 | 0.65 | μC |
| Forward Turn-On Time | t_{on} | Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D) | | | | | |

Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
 b. Pulse width $\leq 300\text{ }\mu\text{s}$; duty cycle $\leq 2\%$.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

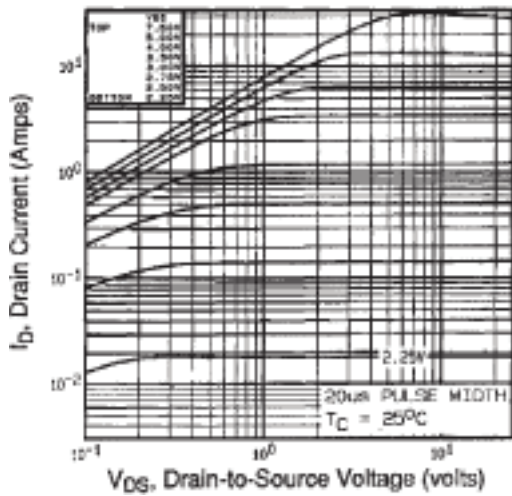


Fig. 1 - Typical Output Characteristics, $T_C = 25\text{ }^\circ\text{C}$

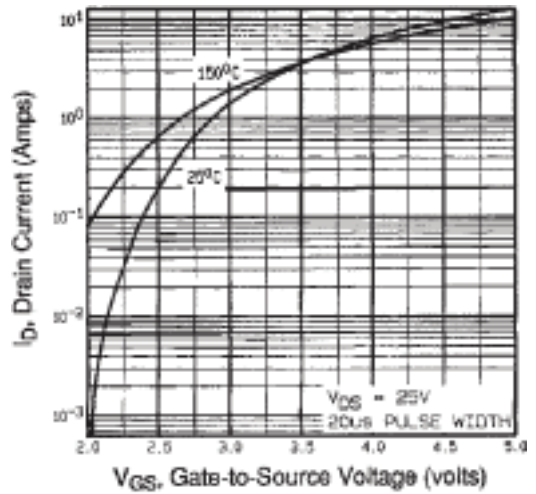


Fig. 3 - Typical Transfer Characteristics

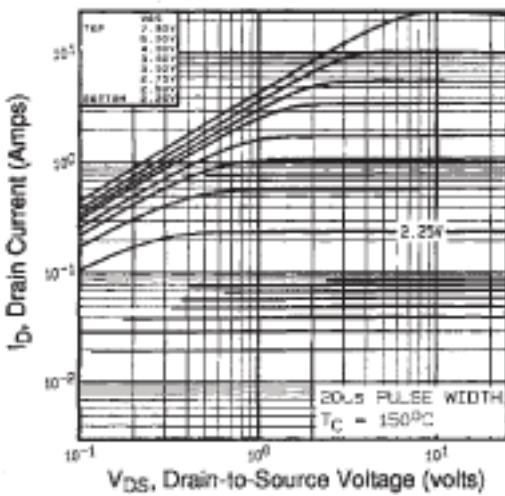


Fig. 2 - Typical Output Characteristics, $T_C = 150\text{ }^\circ\text{C}$

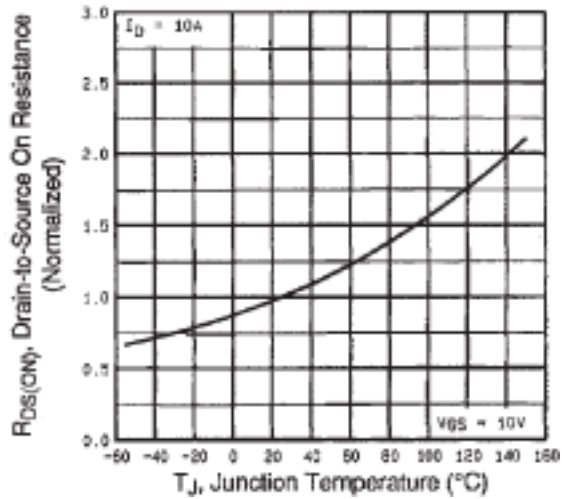


Fig. 4 - Normalized On-Resistance vs. Temperature

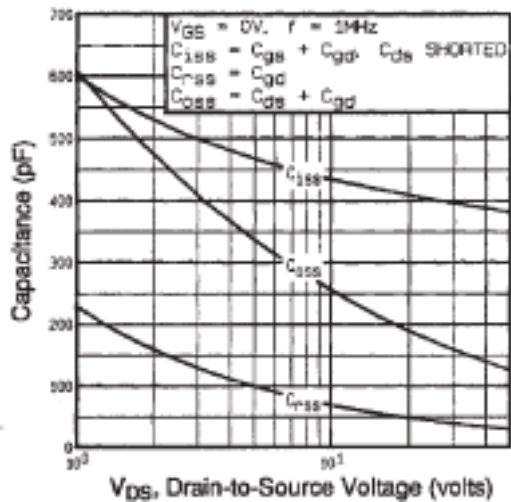


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

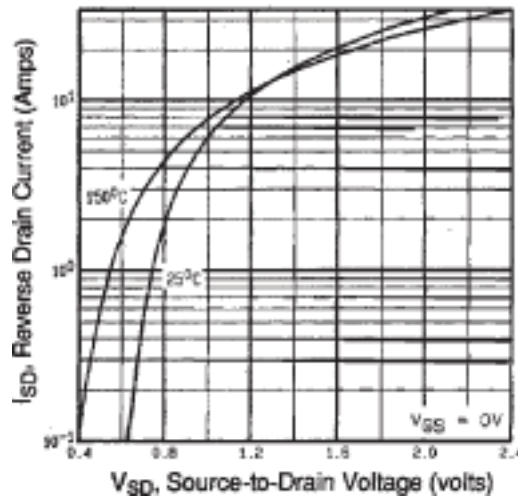


Fig. 7 - Typical Source-Drain Diode Forward Voltage

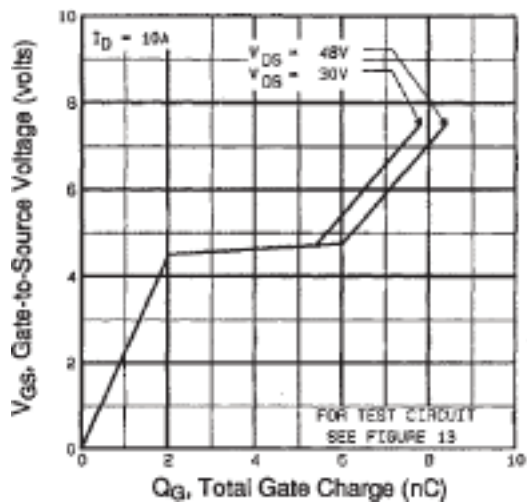


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

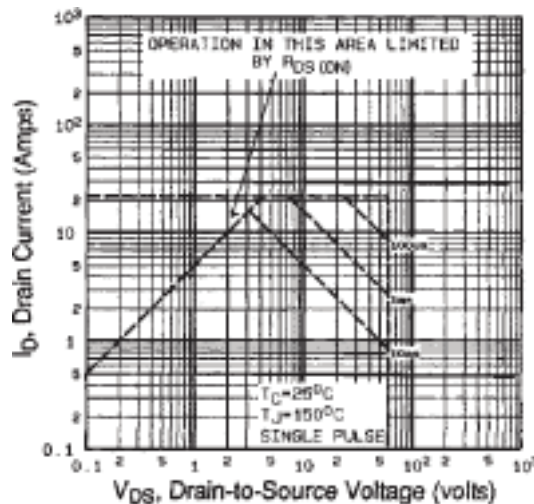


Fig. 8 - Maximum Safe Operating Area

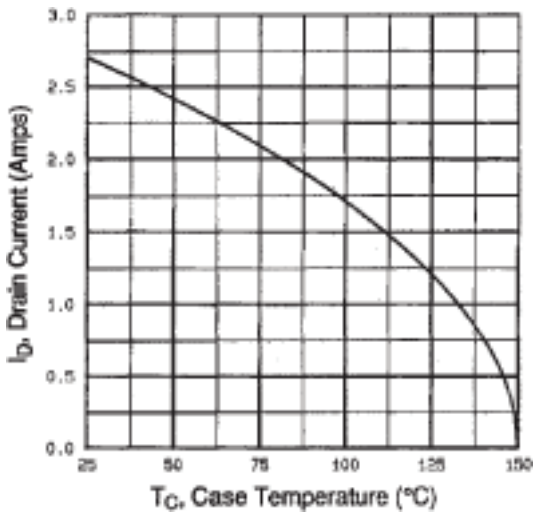


Fig. 9 - Maximum Drain Current vs. Case Temperature

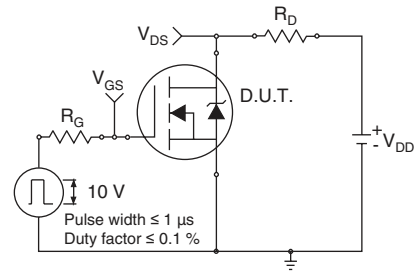


Fig. 10a - Switching Time Test Circuit

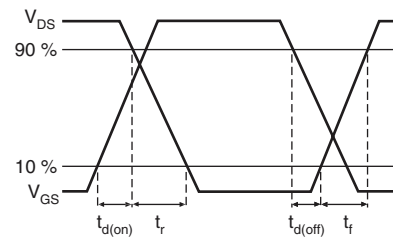


Fig. 10b - Switching Time Waveforms

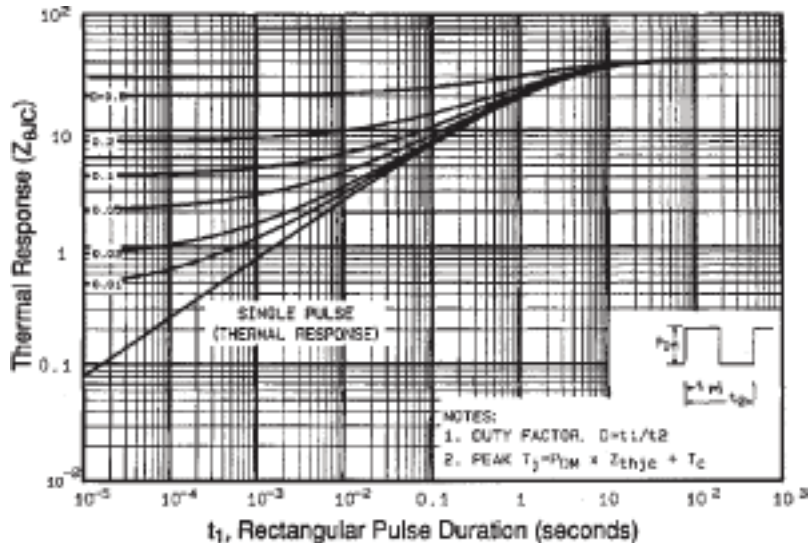


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

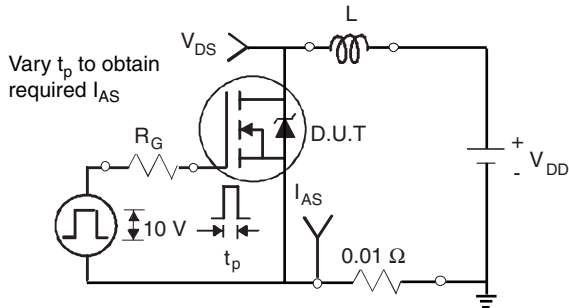


Fig. 12a - Unclamped Inductive Test Circuit

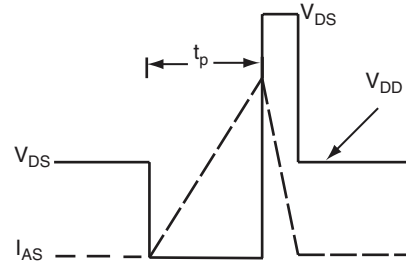


Fig. 12b - Unclamped Inductive Waveforms

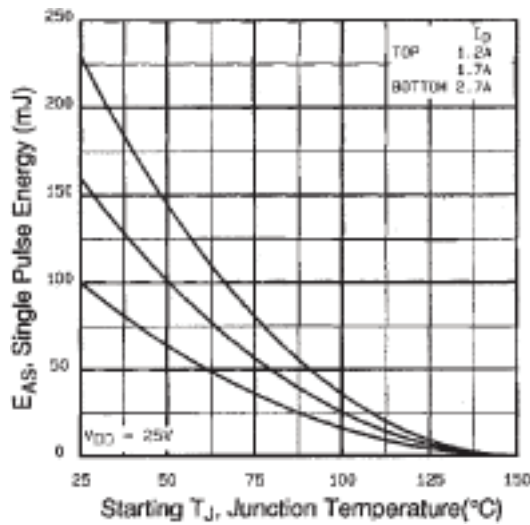


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

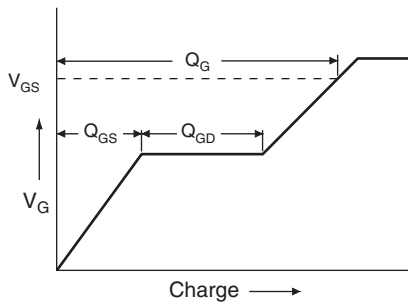


Fig. 13a - Basic Gate Charge Waveform

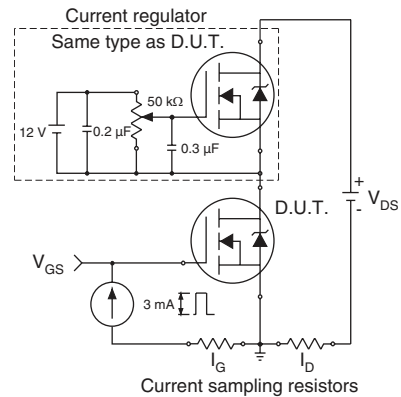
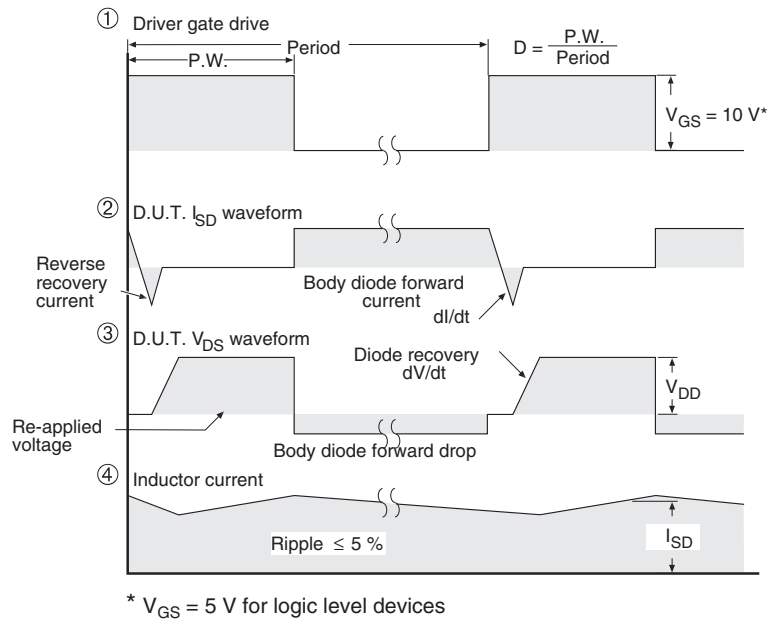
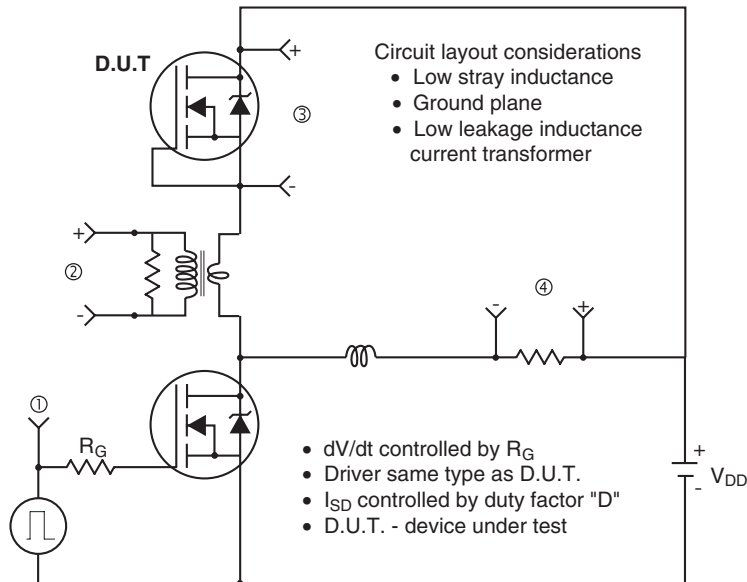


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit

Fig. 14 - For N-Channel

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