

N-Channel MOSFET

Lead Free Package and Finish

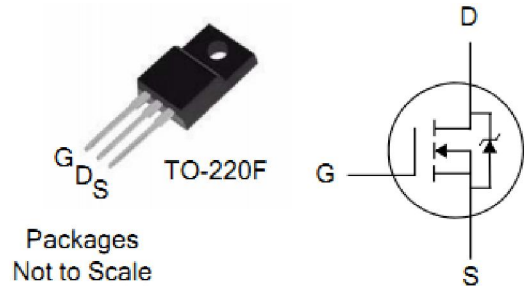
Applications:

- Adaptor
- Charger
- SMPS

| | | |
|-----------|--------------------|-------|
| V_{DSS} | $R_{DS(ON)}(Typ.)$ | I_D |
| 650V | 0.66Ω | 12A |

Features:

- RoHS Compliant
- Low ON Resistance
- Low Gate Charge
- Peak Current vs Pulse Width Curve
- Inductive Switching Curves



Ordering Information

| PART NUMBER | PACKAGE | BRAND |
|-------------|---------|------------|
| ITA12N65R | TO-220F | IPS |

Absolute Maximum Ratings $T_C=25^\circ\text{C}$ unless otherwise specified

| Symbol | Parameter | ITA12N65R | Units |
|---------------------|--|-----------------|---------------------|
| V_{DSS} | Drain-to-Source Voltage | 650 | V |
| I_D | Continuous Drain Current | 12 | A |
| I_{DM} | Pulsed Drain Current, $V_{GS}@10\text{V}$ (NOTE *2) | 48 | A |
| P_D | Power Dissipation | 42 | W |
| | Derating Factor above 25°C | 0.34 | W/ $^\circ\text{C}$ |
| V_{GS} | Gate-to-Source Voltage | ± 30 | V |
| E_{AS} | Single Pulse Avalanche Energy (L=10mH) | 550 | mJ |
| T_L | Maximum Temperature for Soldering | 300 | $^\circ\text{C}$ |
| T_J and T_{STG} | Operating Junction and Storage Temperature Range (NOTE *1) | 150, -55 to 150 | |

Thermal Resistance

| Symbol | Parameter | Typ. | Units | Test Conditions |
|-----------------|---------------------|------|---------------------------|---|
| $R_{\theta JC}$ | Junction-to-Case | 2.98 | $^\circ\text{C}/\text{W}$ | Water cooled heatsink, P_D adjusted for a peak junction temperature of $+150^\circ\text{C}$. |
| $R_{\theta JA}$ | Junction-to-Ambient | 62.5 | | 1 cubic foot chamber, free air. |



ITA12N65R

OFF Characteristics $T_C=25^\circ\text{C}$ unless otherwise specified

| Symbol | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|------------|-----------------------------------|------|------|------|---------|---|
| BV_{DSS} | Drain-to-Source Breakdown Voltage | 650 | -- | -- | V | $V_{GS}=0V, I_D=250\mu A$ |
| I_{DSS} | Drain-to-Source Leakage Current | -- | -- | 1 | μA | $V_{DS}=650V, V_{GS}=0V$ $T_J=25^\circ\text{C}$ |
| | | -- | -- | 100 | | $V_{DS}=520V, V_{GS}=0V$ $T_J=125^\circ\text{C}$ |
| I_{GSS} | Gate-to-Source Forward Leakage | -- | -- | +100 | nA | $V_{GS}=+30V$ |
| | Gate-to-Source Reverse Leakage | -- | -- | -100 | | $V_{GS}=-30V$ |

ON Characteristics $T_J=25^\circ\text{C}$ unless otherwise specified

| Symbol | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|--------------|--|------|------|------|----------|-------------------------------|
| $R_{DS(ON)}$ | Static Drain-to-Source On-Resistance (NOTE *3) | -- | 0.66 | 0.8 | Ω | $V_{GS}=10V, I_D=6A$ |
| $V_{GS(TH)}$ | Gate Threshold Voltage | 2 | -- | 4 | V | $V_{DS}=V_{GS}, I_D=250\mu A$ |
| g_{fs} | Forward Transconductance (NOTE *3) | -- | 12 | -- | S | $V_{DS}=15V, I_D=6A$ |

Dynamic Characteristics Essentially independent of operating temperature

| Symbol | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|-----------|---------------------------------|------|------|------|-------|--|
| C_{iss} | Input Capacitance | -- | 1993 | -- | pF | $V_{GS}=0V, V_{DS}=25V$ $f=1.0\text{MHz}$ |
| C_{oss} | Output Capacitance | -- | 160 | -- | | |
| C_{rss} | Reverse Transfer Capacitance | -- | 9.5 | -- | | |
| Q_g | Total Gate Charge | -- | 40 | -- | nC | $I_D=12A, V_{DD}=520V$ $V_{GS}=10V$ |
| Q_{gs} | Gate-to-Source Charge | -- | 10 | -- | | |
| Q_{gd} | Gate-to-Drain ("Miller") Charge | -- | 14 | -- | | |

Resistive Switching Characteristics Essentially independent of operating temperature

| Symbol | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|--------------|---------------------|------|------|------|-------|--|
| $t_{d(ON)}$ | Turn-on Delay Time | -- | 28 | | ns | $V_{DD}=325V, I_D=12A,$ $V_G=10V, R_G=10\Omega$ |
| t_{rise} | Rise Time | -- | 26 | | | |
| $t_{d(OFF)}$ | Turn-Off Delay Time | -- | 64 | | | |
| t_{fall} | Fall Time | -- | 45 | | | |



ITA12N65R

Source-Drain Diode Characteristics

T_c=25°C unless otherwise specified

| Symbol | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|-----------------|---|------|------|------|-------|--|
| I _S | Continuous Source Current (Body Diode) | -- | -- | 12 | A | T _C =25°C |
| I _{SM} | Maximum Pulsed Current (Body Diode) | -- | -- | 48 | A | |
| V _{SD} | Diode Forward Voltage | -- | -- | 1.5 | V | I _{SD} =12A, V _{GS} =0V |
| t _{rr} | Reverse Recovery Time | -- | 651 | -- | ns | I _F = I _S di/dt=100A/us |
| Q _{rr} | Reverse Recovery Charge | -- | 4297 | -- | nC | |

Notes:

- *1. T_J = +25°C to +150°C.
- *2. Repetitive rating; pulse width limited by maximum junction temperature.
- *3. Pulse width < 380µs; duty cycle < 2%.

Characteristics Curve:

Figure 1. Maximum Effective Thermal Impedance, Junction-to-Case

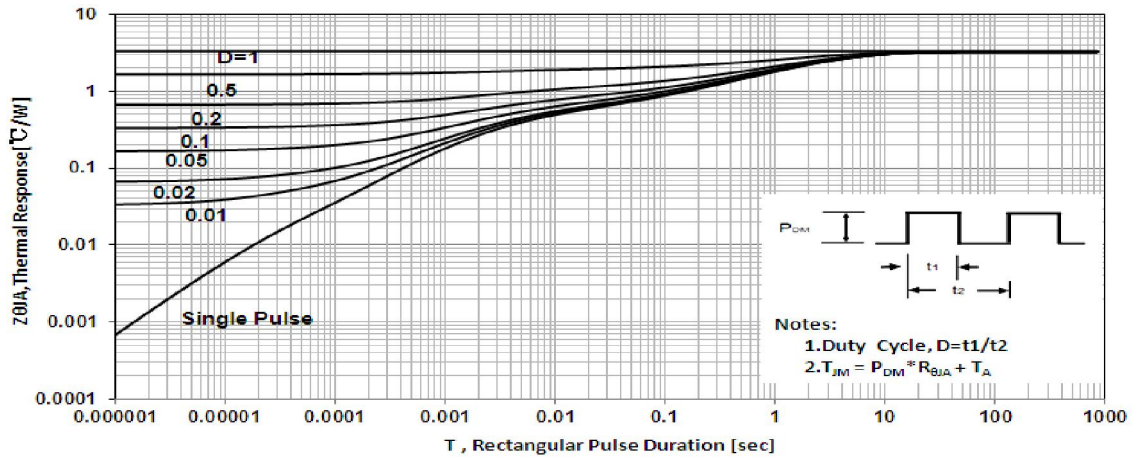


Figure 2. Typical Output Characteristics

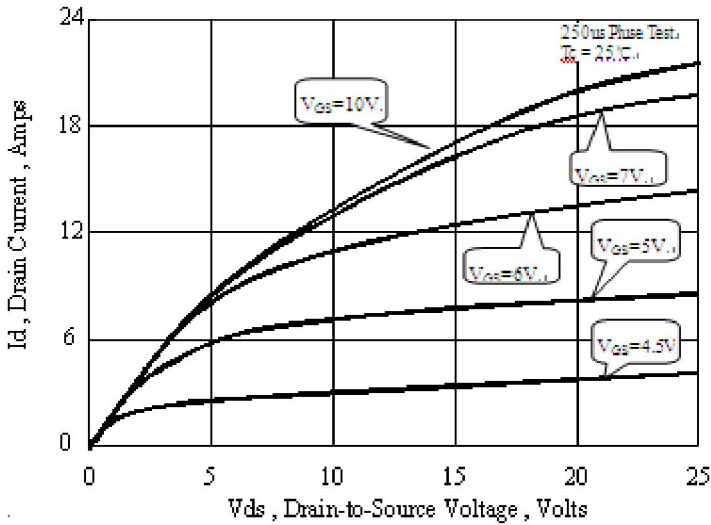


Figure 3. Typical Transfer Characteristics

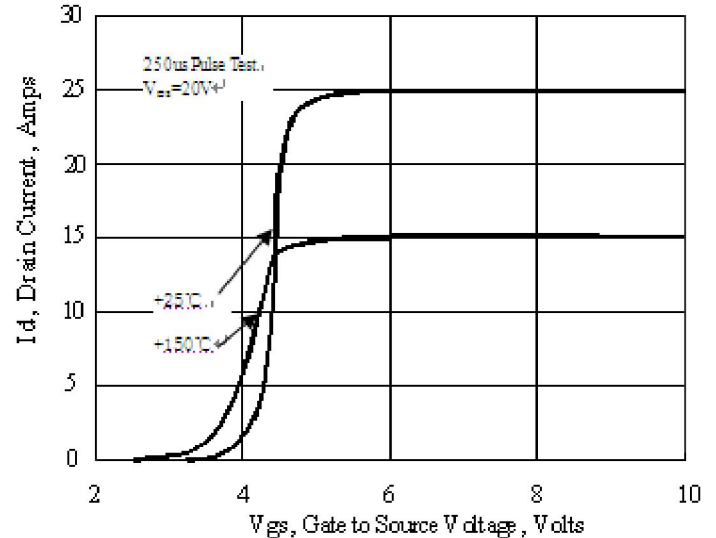


Figure 4. Typical Body Diode Transfer Characteristics

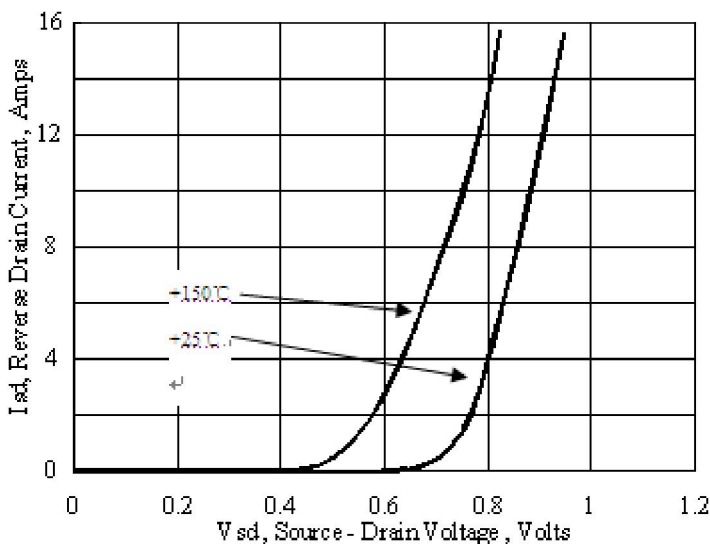


Figure 5. Typical Drain-to-source on Resistance VS Drain Current

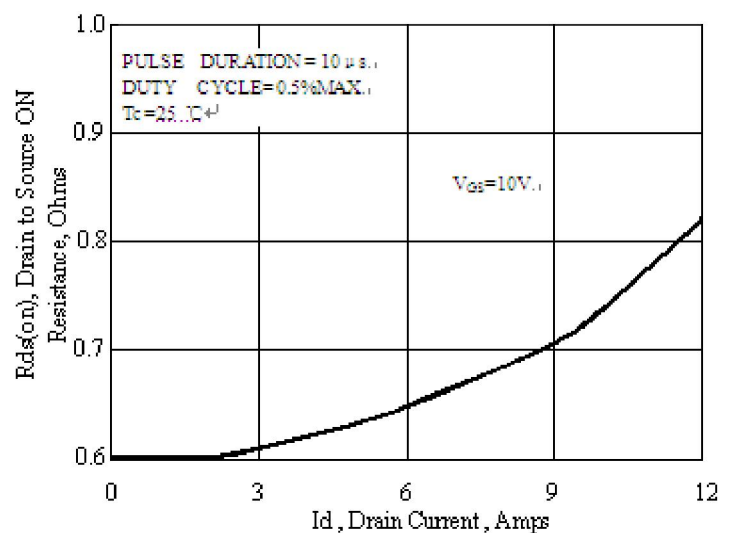


Figure 6. Capacitance VS Drain-to-Source Voltage

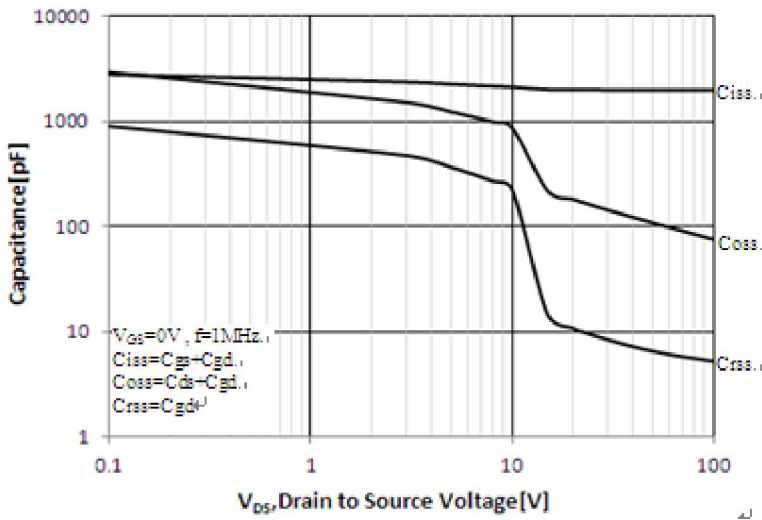


Figure 7. Gate Charge VS Gate-to-Source Voltage

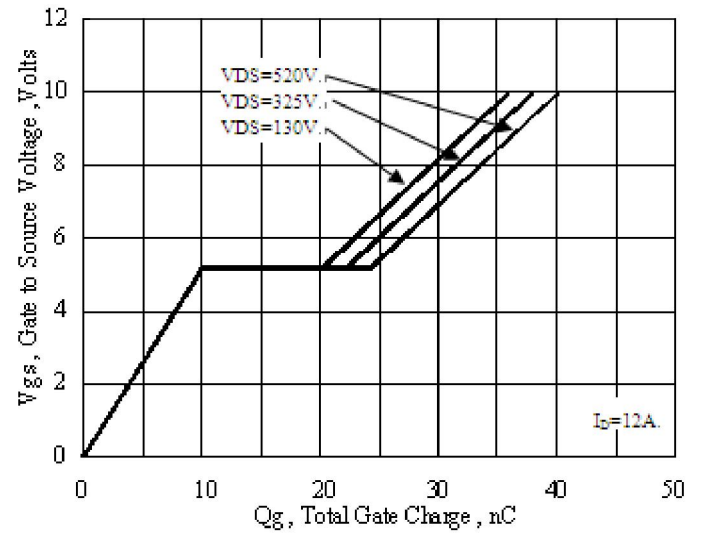


Figure 8. Breakdown Voltage VS Temperature

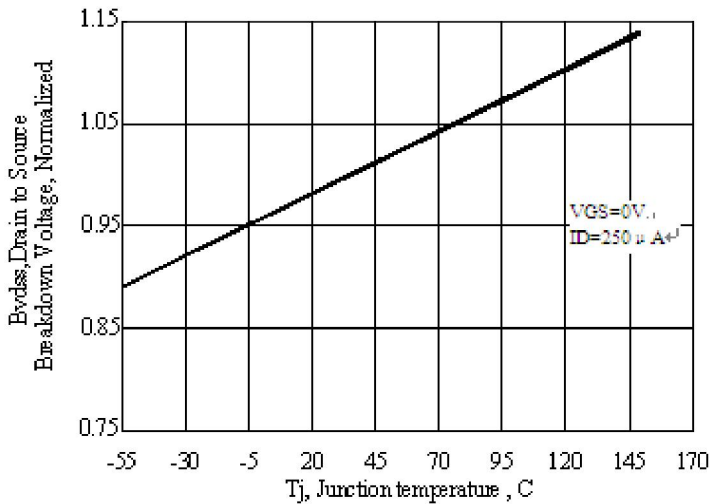


Figure 9. on-Resistance VS Temperature

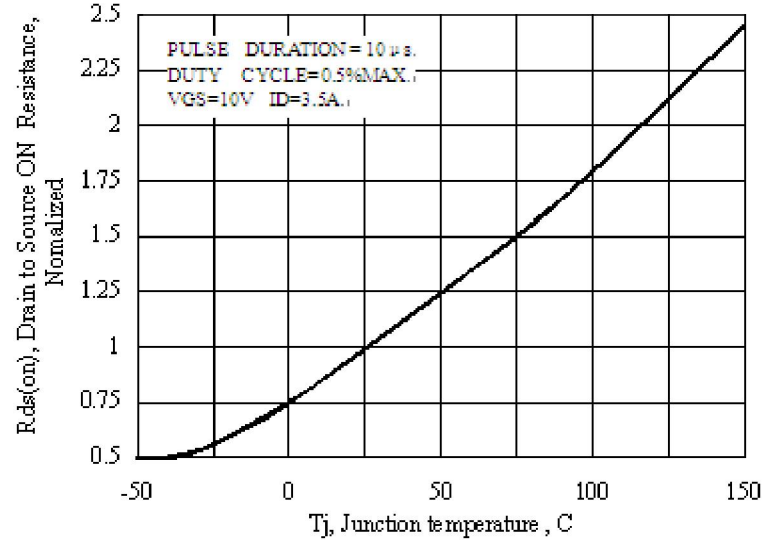
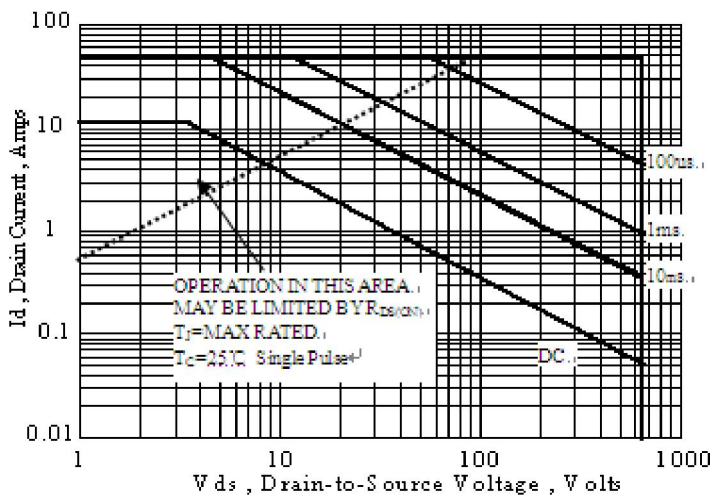


Figure 10. Safe Operating Area



Test Circuits and Waveforms

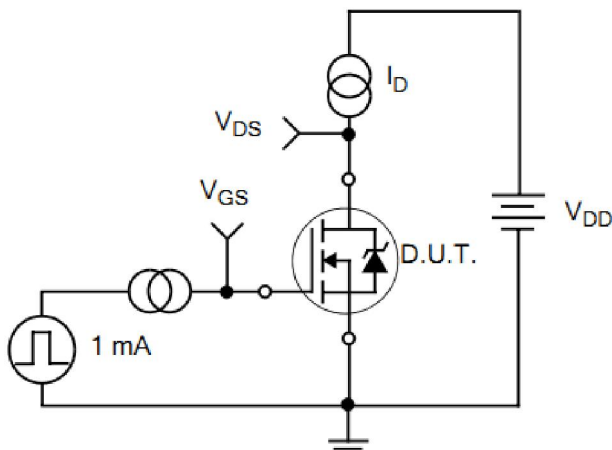


Figure 11. Gate Charge Test Circuit

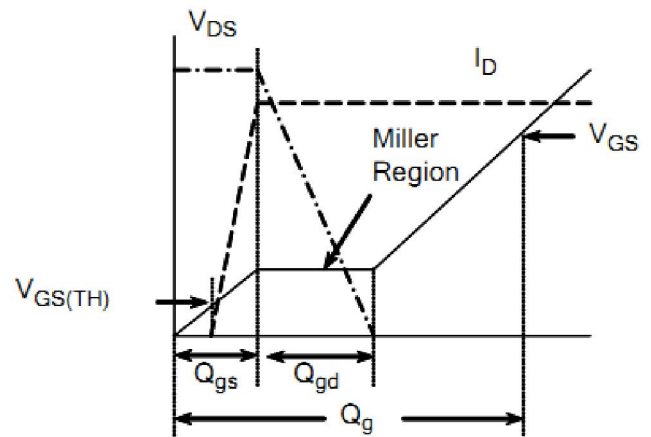


Figure 12. Gate Charge Waveforms

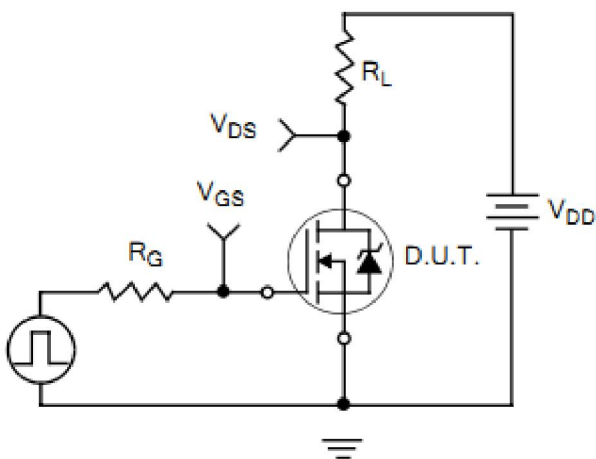


Figure 13. Resistive Switching Test Circuit

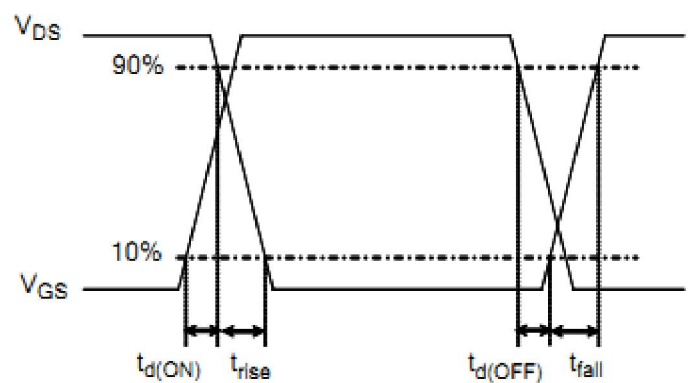


Figure 14. Resistive Switching Waveforms

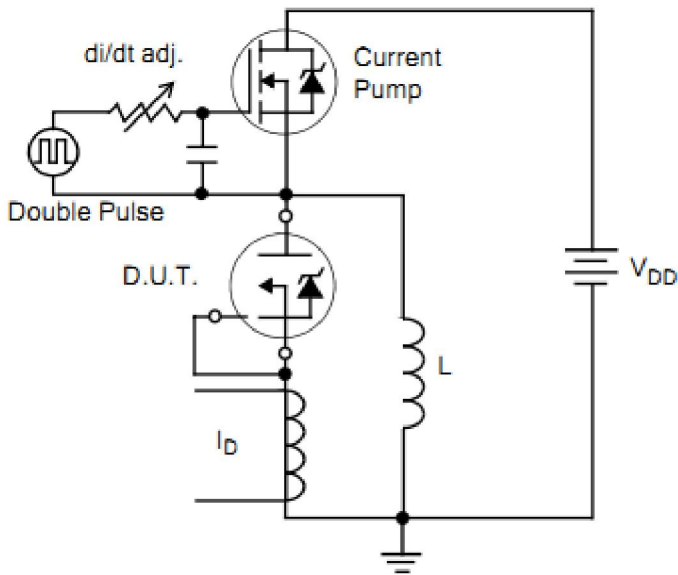


Figure 15. Diode Reverse Recovery Test Circuit

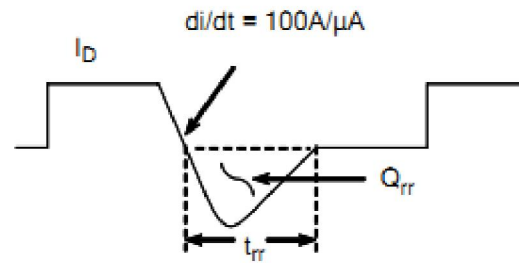


Figure 16. Diode Reverse Recovery Waveform

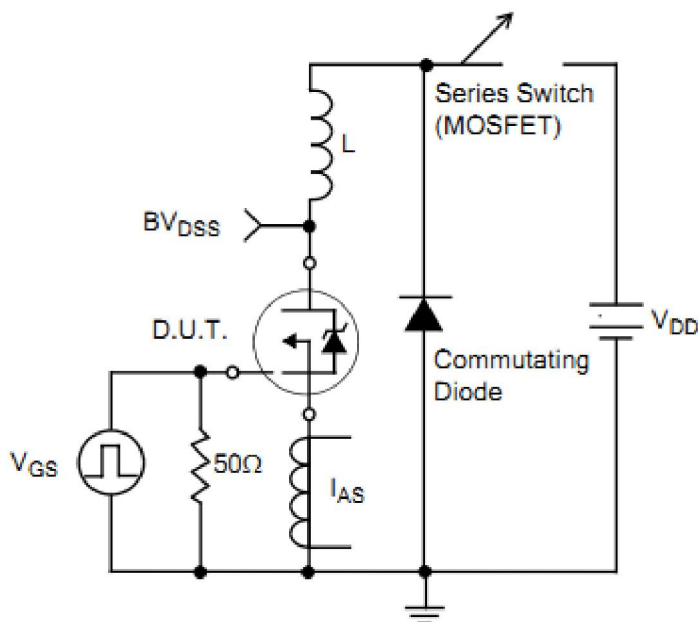


Figure 17. Unclamped Inductive Switching Test Circuit

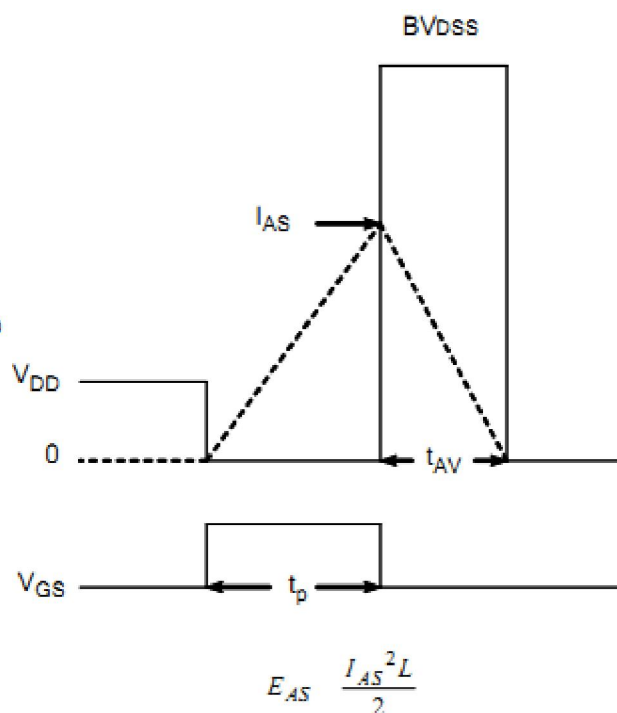


Figure 18. Unclamped Inductive Switching Waveform



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