

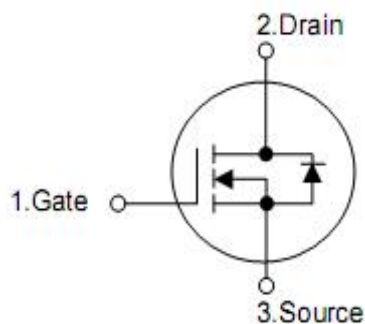
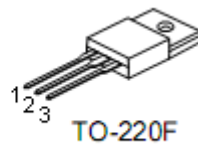
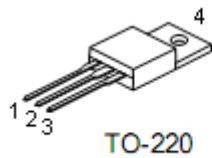
1. General Features

- n Proprietary New Planar Technology
- n $R_{DS(ON),typ.}=0.35\Omega@V_{GS}=10V$
- n Low Gate Charge Minimize Switching Loss
- n Fast Recovery Body Diode

2. Applications

- n Ballast and Lighting
- n DC-AC Inverter
- n Other Applications

3. Pin configuration



| Pin | Function |
|-----|----------|
| 1 | Gate |
| 2 | Drain |
| 3 | Source |
| 4 | Drain |

4. Ordering Information

| Part Number | Package | Brand |
|-------------|---------|-------|
| KNP6140A | TO-220 | KIA |
| KNF6140A | TO-220F | KIA |

5. Absolute maximum ratings

(T_c= 25 °C , unless otherwise specified)

| Symbol | Parameter | KNP6140A | KNF6140A | Unit |
|------------------------------------|--|------------|----------|-------|
| V _{DSS} | Drain-to-Source Voltage ^[1] | 400 | | V |
| V _{GSS} | Gate-to-Source Voltage | ±30 | | |
| I _D | Continuous Drain Current | 10 | 10* | A |
| | Continuous Drain Current@ T _c =100 °C | Figure3 | | |
| I _{DM} | Pulsed Drain Current at V _{GS} =10V ^[2] | Figure6 | | |
| E _{AS} | Single Pulse Avalanche Energy | 650 | | mJ |
| dv /dt | Peak Diode Recovery dv/dt ^[3] | 5.0 | | V/ns |
| P _D | Power Dissipation | 140 | 45 | W |
| | Derating Factor above 25 °C | 1.12 | 0.37 | W/ °C |
| T _L T _{PAK} | Maximum Temperature for Soldering Leads at 0.063in (1.6mm) from Case for 10 seconds, Package Body for 10 seconds | 300 260 | | °C |
| T _J &T _{STG} | Operating and Storage Temperature Range | -55 to 150 | | |

*Drain current limited by maximum junction temperature

Caution: Stresses greater than those listed in the “Absolute Maximum Ratings” may cause permanent damage to the device.

6. Thermal characteristics

| Symbol | Parameter | KNP6140A | KNF6140A | Unit |
|------------------|---|----------|----------|-------|
| R _{θJC} | Thermal Resistance, Junction-to-Case | 0.89 | 2.7 | °C /W |
| R _{θJA} | Thermal Resistance, Junction-to-Ambient | 62 | 100 | |

7. Electrical characteristics

| OFF Characteristics | | (T _J =25°C, unless otherwise specified) | | | | |
|---|---|---|------|------|------|------|
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
| B _V DSS | Drain-to-Source Breakdown Voltage | V _{GS} =0V, I _D =250μA | 400 | -- | -- | V |
| I _{DSS} | Drain-to-Source Leakage Current | V _{DS} =400V, V _{GS} =0V | -- | -- | 1 | μA |
| | | V _{DS} =320V, V _{GS} =0V, T _J =125°C | -- | -- | 100 | |
| I _{GSS} | Gate-to-Source Leakage Current | V _{GS} =+30V, V _{DS} =0V | -- | -- | +100 | nA |
| | | V _{GS} =-30V, V _{DS} =0V | -- | -- | -100 | |
| ON Characteristics | | (T _J =25°C, unless otherwise specified) | | | | |
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
| R _{DS(ON)} | Static Drain-to-Source On-Resistance ^[4] | V _{GS} =10V, I _D =5A | -- | 0.35 | 0.5 | Ω |
| V _{GS(TH)} | Gate Threshold Voltage | V _{DS} =V _{GS} , I _D =250μA | 2.0 | -- | 4.0 | V |
| g _{FS} | Forward Transconductance ^[4] | V _{DS} =20V, I _D =10A | -- | 12 | -- | S |
| Dynamic Characteristics | | Essentially independent of operating temperature | | | | |
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =25V, f=1.0MHZ | -- | 1254 | -- | pF |
| C _{rss} | Reverse Transfer Capacitance | | -- | 21 | -- | |
| C _{oss} | Output Capacitance | | -- | 150 | -- | |
| Q _g | Total Gate Charge | V _{DD} =200V, I _D =10A, V _{GS} =0 to 10V | -- | 28 | -- | nC |
| Q _{gs} | Gate-to-Source Charge | | -- | 7.0 | -- | |
| Q _{gd} | Gate-to-Drain (Miller) Charge | | -- | 11 | -- | |
| Resistive Switching Characteristics | | Essentially independent of operating temperature | | | | |
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
| t _{d(ON)} | Turn-on Delay Time | V _{DD} =200V, I _D =10A, V _{GS} =10V, R _G =12Ω | -- | 14 | -- | nS |
| t _{rise} | Rise Time | | -- | 25 | -- | |
| t _{d(OFF)} | Turn-Off Delay Time | | -- | 44 | -- | |
| t _{fall} | Fall Time | | -- | 28 | -- | |
| Source-Drain Body Diode Characteristics | | (T _J =25°C, unless otherwise specified) | | | | |
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
| I _{SD} | Continuous Source Current ^[4] | Integral PN-diode in MOSFET | -- | -- | 10 | A |
| I _{SM} | Pulsed Source Current ^[4] | | -- | -- | 40 | |
| V _{SD} | Diode Forward Voltage | I _S =10A, V _{GS} =0V | -- | -- | 1.5 | V |
| t _{rr} | Reverse recovery time | V _{GS} =0V, I _F =10A, diF/dt=100A/μs | -- | 303 | -- | ns |
| Q _{rr} | Reverse recovery charge | | -- | 1.8 | -- | μC |

Note:

1. T_J=+25°C to +150°C
2. Repetitive rating; pulse width limited by maximum junction temperature.
3. I_{SD}=10A di/dt<100A/μs, V_{DD}<B_VDSS, T_J=+150°C.
4. Pulse width≤380μs; duty cycle≤2%.

8. Test circuits and waveforms

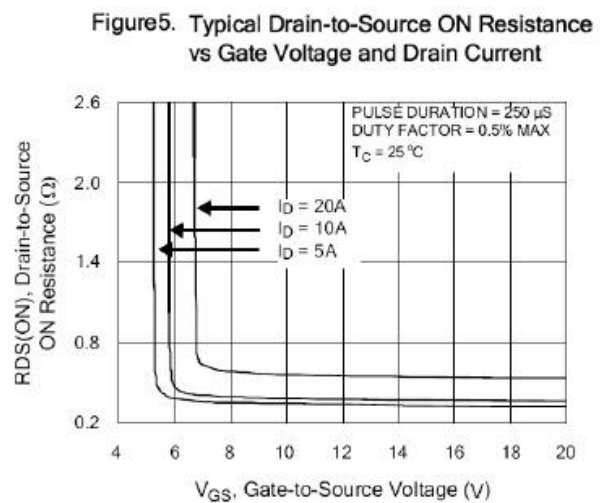
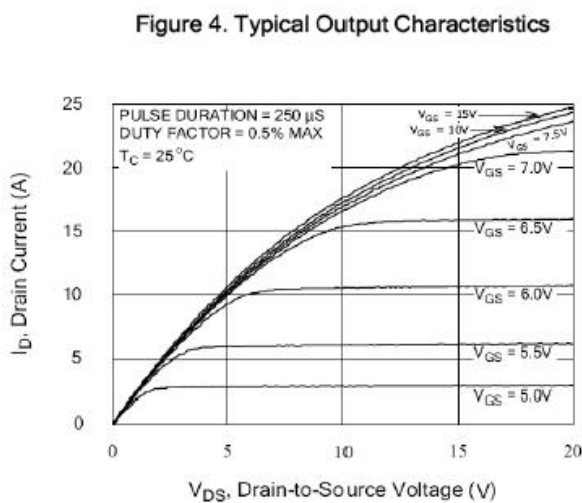
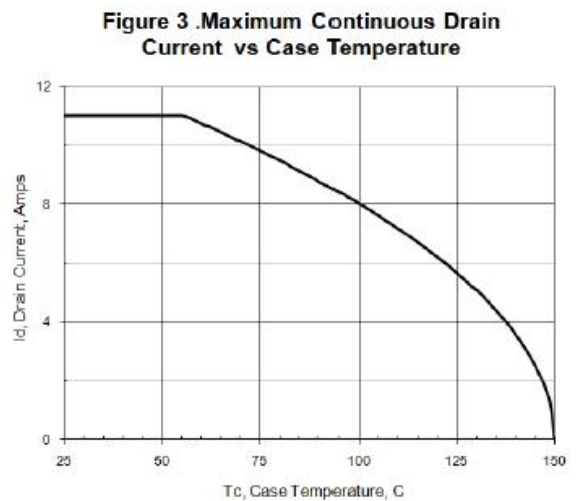
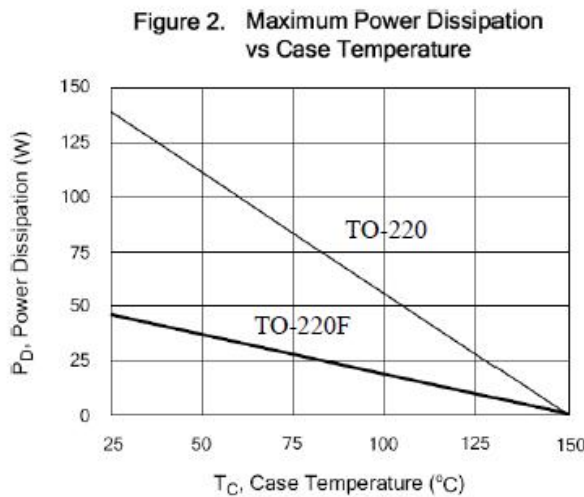
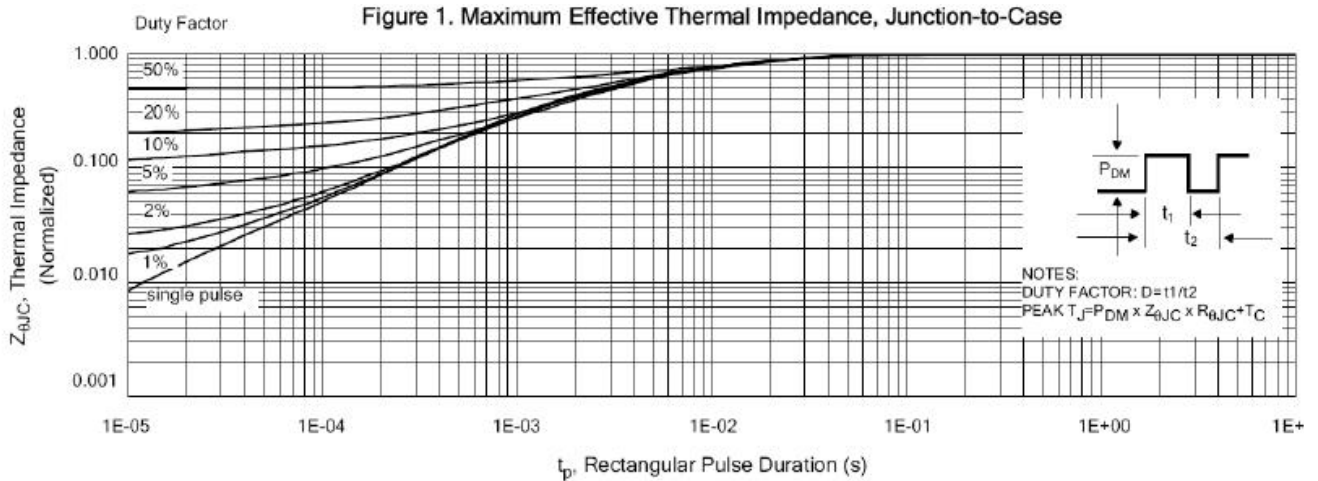


Figure 6. Peak Current Capability

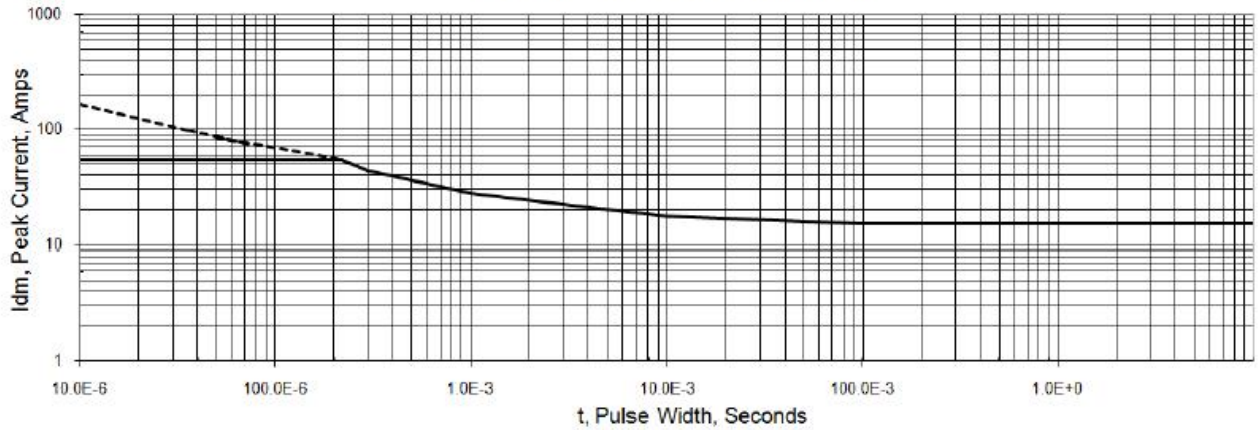


Figure 7. Typical Transfer Characteristics

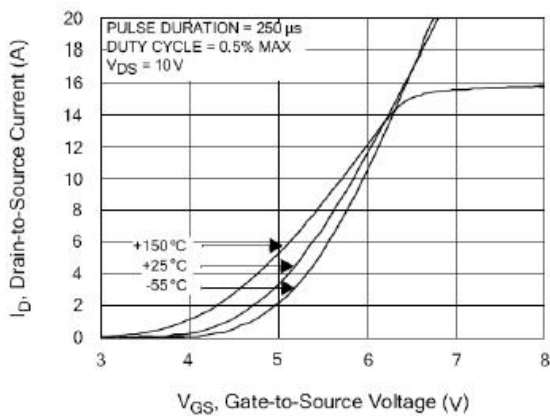


Figure 9. Typical Drain-to-Source ON Resistance vs Drain Current

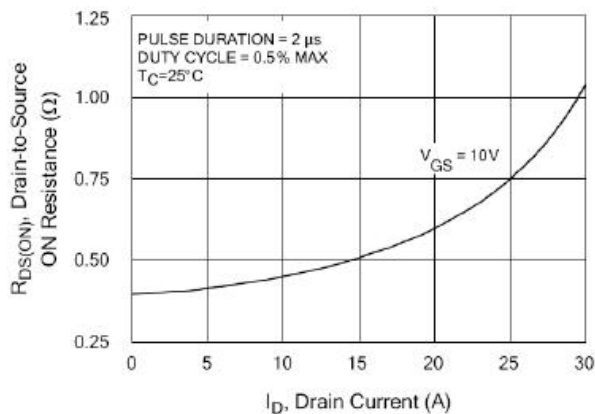


Figure 8. Unclamped Inductive Switching Capability

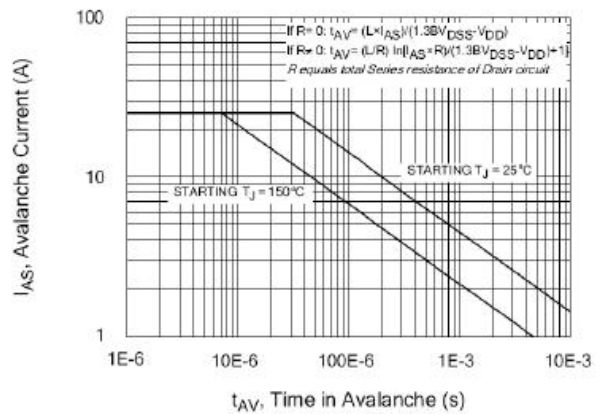


Figure 10. Typical Drain-to-Source ON Resistance vs Junction Temperature

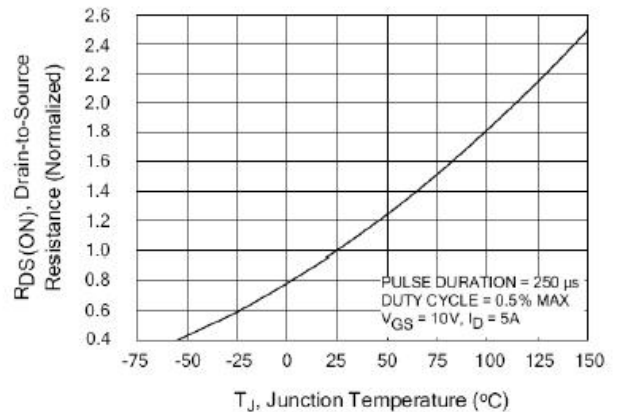


Figure 11. Typical Breakdown Voltage vs Junction Temperature

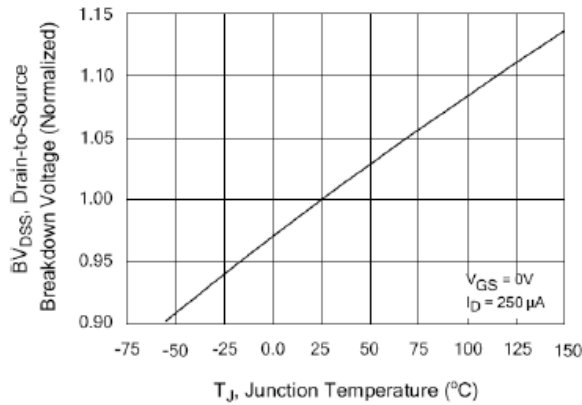


Figure 12. Typical Threshold Voltage vs Junction Temperature

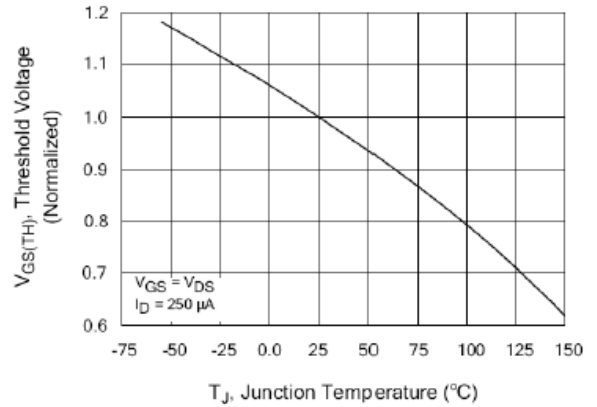


Figure 13. Maximum Forward Bias Safe Operating Area

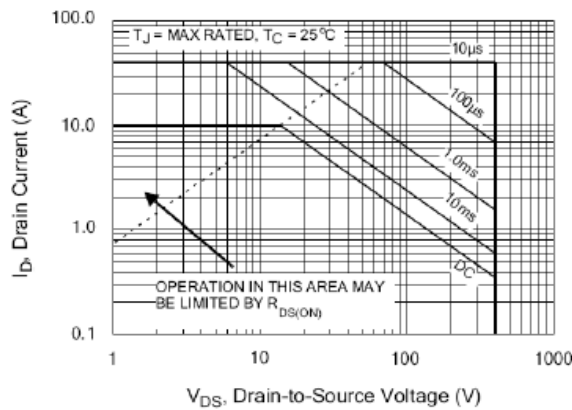


Figure 14. Typical Capacitance vs Drain-to-Source Voltage

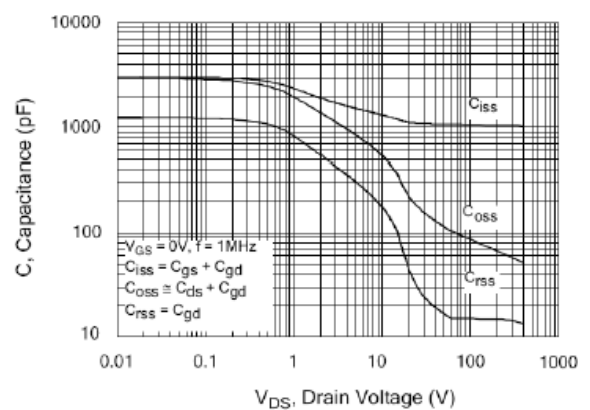


Figure 15. Typical Gate Charge vs Gate-to-Source Voltage

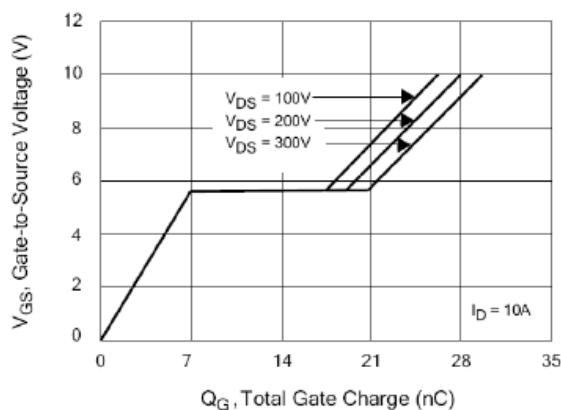
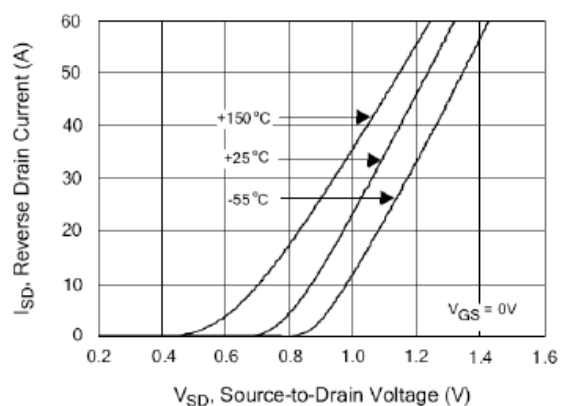


Figure 16. Typical Body Diode Transfer Characteristics



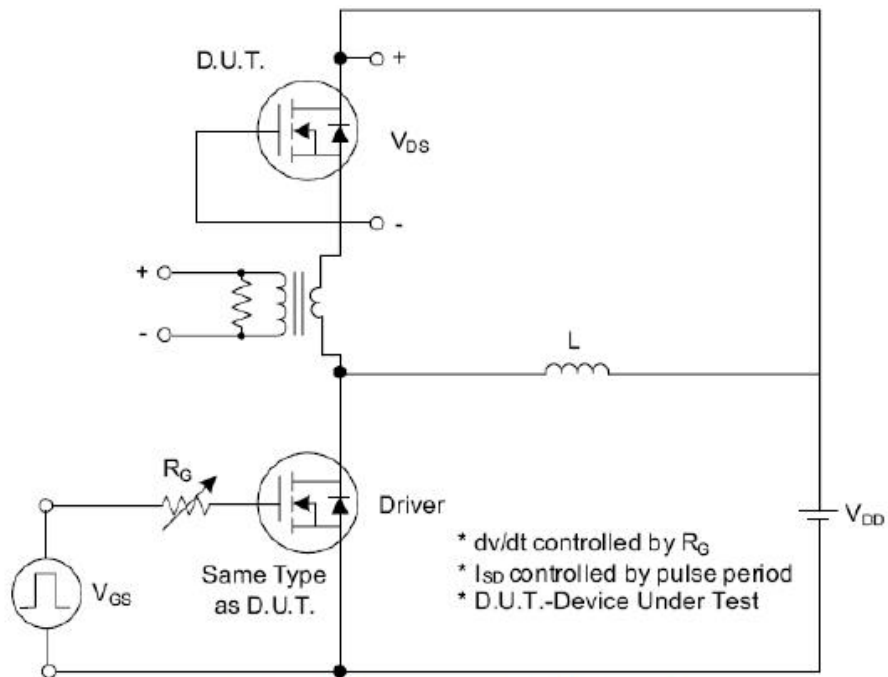


Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit

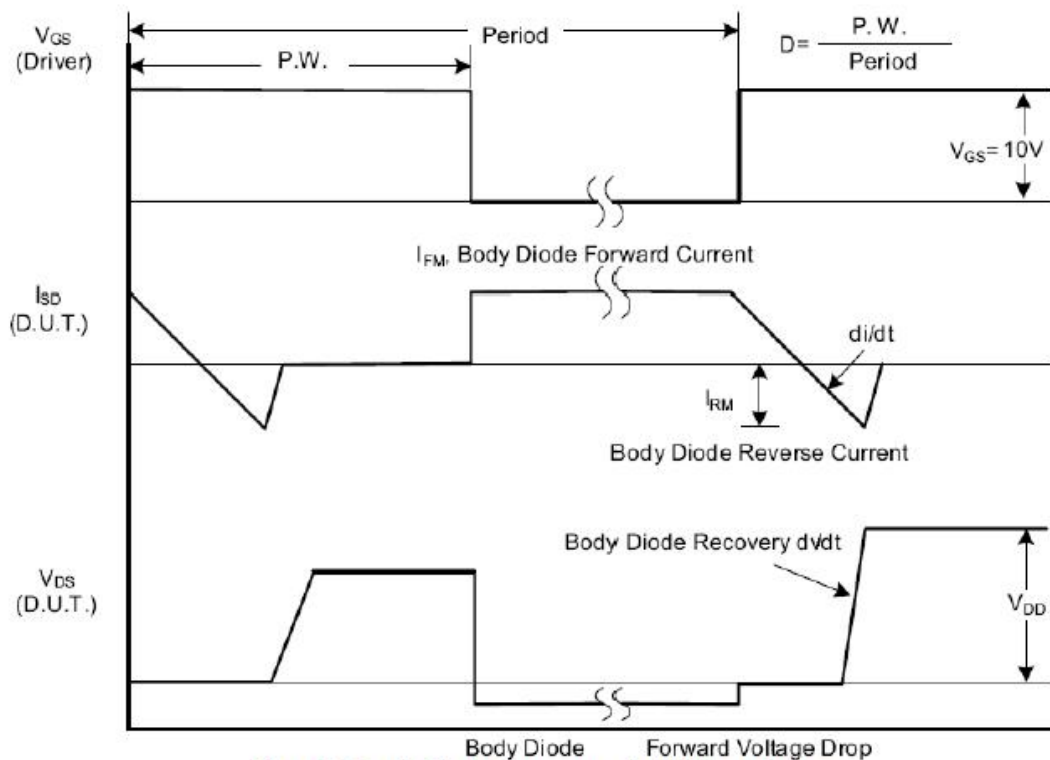


Fig. 1.2 Peak Diode Recovery dv/dt Waveforms

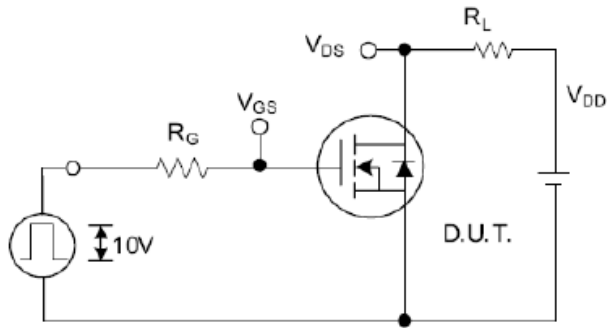


Fig. 2.1 Switching Test Circuit

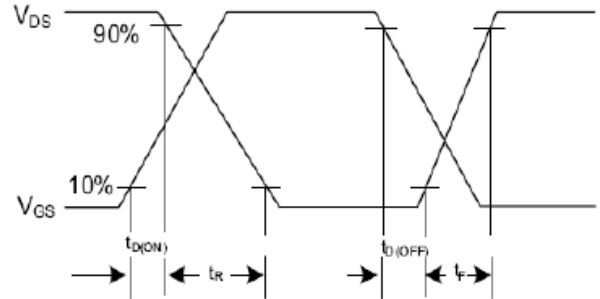


Fig. 2.2 Switching Waveforms

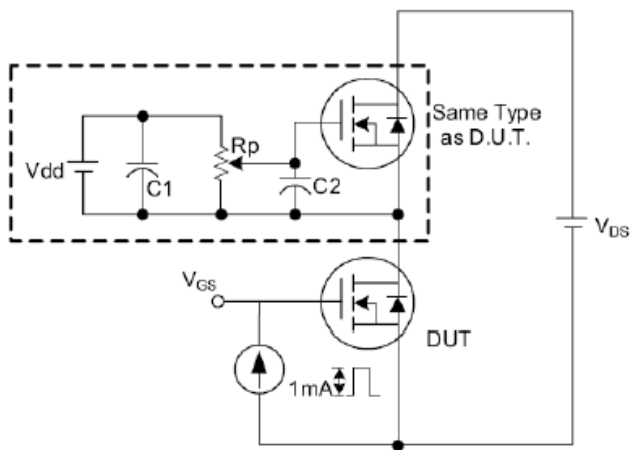


Fig. 3.1 Gate Charge Test Circuit

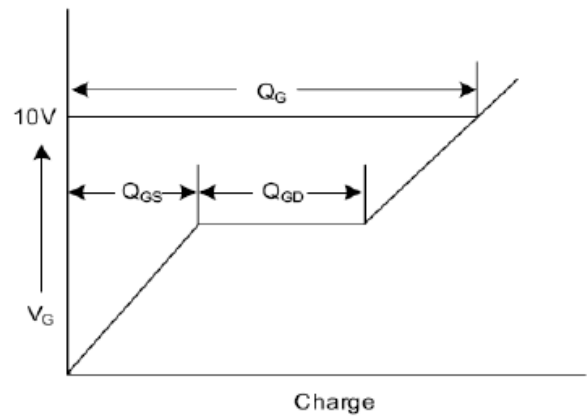


Fig. 3.2 Gate Charge Waveform

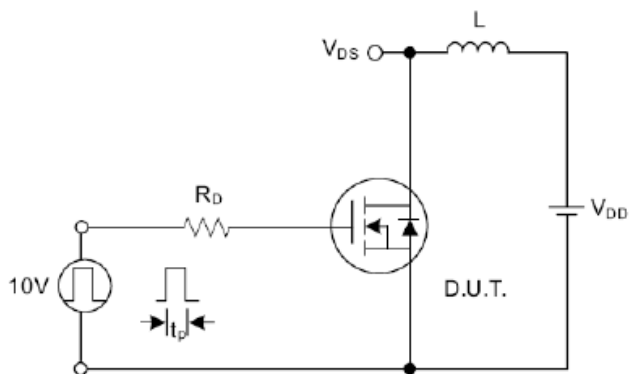


Fig. 4.1 Unclamped Inductive Switching Test Circuit

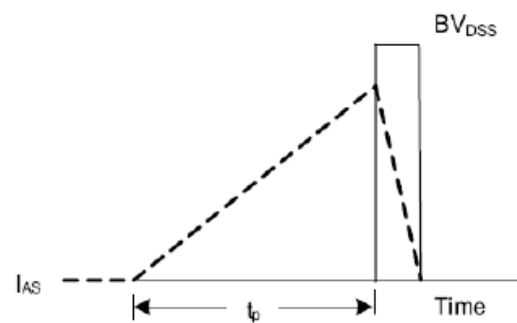


Fig. 4.2 Unclamped Inductive Switching Waveforms