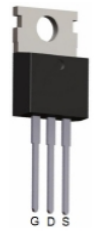
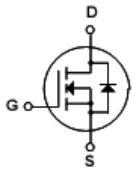
# TS7N65

## 7.0Amps, 650V N-Channel Power Mosfet

DRAWING




### Features

- 7.0A,650V,$R_{DSON}$=1.3Ω@$V_{GS}$=10V
- Ultra low gate charge(typical 28nc )
- Low reverse transfer capacitance ($C_{RSS}$=typical 12.0 PF )
- Fast switching capability
- Avalanche energy specified
- Improved dv/dt capability，high ruggedness

### General Description

- Package:TO-220C
- This is a high voltage and high current power MOSFET ,Designed to have better characteristics, such as fast switching time , low gate charge, low on-state resistance and have a high rugged avalanche characteristics.This power MOSFET is usually used at high speed switching applications in power supplies ,PWM motor controls. High efficient DC to DC converters and bridge circuits.

### Absolute Maximum Ratings

| Symbol | Parameter | Spec | Units |
|---|---|---|---|
| $V_{DSS}$ | Drain-Source Voltage | 650 | V |
| $I_D$ | Drain Current -Continuous(Tc=25℃) | 7.0 | A |
| $I_{AR}$ | Avalanche Current | 7.0 | A |
| $I_{DM}$ | Drain Current -Pulsed | 32 | A |
| $V_{GSS}$ | Gate-Source Voltage | ±30 | V |
| $E_{AS}$ | Single Pulsed Avalanche Energy | 530 | mJ |
| $E_{AR}$ | Repetitive Avalanche Energy | 14.2 | mJ |
| dv/dt | Peak Diode Recovery dv/dt | 4.5 | V/ns |
| $P_D$ | Power Dissipation | 142 | W |
| Tj | Junction Temperature | +150 | ℃ |
| Topr | Operating Temperature Range | -55 to +150 | ℃ |
| $T_{stg}$ | Storage Temperature | -55 to +150 | ℃ |

### Thermal Characteristics

| Symbol | Parameter | Typ | Max | Units |
|---|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case | _ | 0.88 | ℃/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | _ | 62.5 | ℃/W |

### Electrical Characteristics(Tc=25℃ unless otherwise noted)

## Off Characteristics

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V,$I_D$=250uA | 650 | _ | _ | V |
| $BV_{DSS}/T_J$ | Breakdown Voltage Temperature Coefficient | ID=250uA,Referenced to 25℃ | _ | 0.7 | _ | V/℃ |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=650V,$V_{GS}$=0V | _ | _ | 1 | uA |
| $I_{GSSF}$ | Gate-Body Leakage Current,Forward | Vgs=30V,Vds=0V | _ | _ | 100 | nA |
| $I_{GSSR}$ | Gate-Body Leakage Current,Reverse | Vgs=-30V,Vds=0V | _ | _ | -100 | nA |

## On Characteristics

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| $V_{GSTH}$ | Gate Threshold Voltage | VDS=VGS,ID=250uA | 2.0 | _ | 4.0 | V |
| $R_{DSON}$ | Static Drain-Source On-Resistance | VGS=10V,ID=3.5A | _ | 1.0 | 1.3 | Ω |

## Dynamic Characteristics

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Cjss | Input Capacitance | VDS=25V,VGS=0V,f=1.0$MH_Z$ | _ | 1245 | 1655 | pF |
| Coss | Output Capacitance | | _ | 125 | 165 | pF |
| Crss | Reverse Transfer Capacitance | | _ | 12 | 16 | pF |

## Switching Characteristics

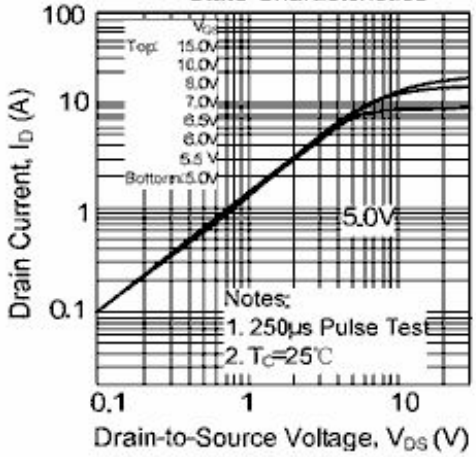
| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| $t_{don}$ | Turn-On Delay Time | $V_{DD}$=300V<br>$I_D$=7.0A<br>$R_G$=25Ω | _ | 16.5 | 45 | ns |
| $t_r$ | Turn-On Rise Time | | _ | 60.5 | 130 | ns |
| $t_{doff}$ | Turn-Off Delay Time | | _ | 81 | 170 | ns |
| $t_f$ | Turn-Off Fall Time | | _ | 64.5 | 140 | ns |
| $Q_g$ | Total Gate Charge | $V_{DS}$=480V<br>$I_D$=7.0A<br>$V_{GS}$=10V | _ | 28 | 36 | nc |
| $Q_{gs}$ | Gate-Source Charge | | _ | 4.5 | | nc |
| $Q_{gd}$ | Gate-Drain Charge | | _ | 12 | | nc |

## Drain-Source Diode Characteristics and Maximum Ratings

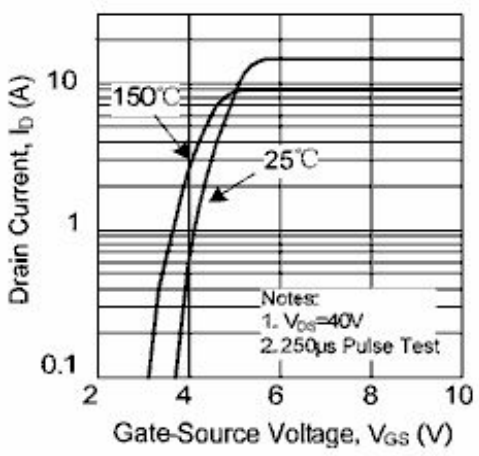
| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Is | Maximum Continuous Drain-source diode forward current | | _ | _ | 7.0 | A |
| Ism | Maximum pulsed drain-source diode diode forward current | | _ | _ | 32 | A |
| Vsd | Drain-source diode forward Voltage | VGS=0V,IS=7A | _ | _ | 1.4 | V |
| Trr | Reverse Recovery Time | VGS=0V,IS=7A<br>dif/dt=100A/us | _ | 365 | _ | ns |
| Qrr | Reverse Recovery charge | | _ | 3.4 | _ | uc |

## Typical Characteristics

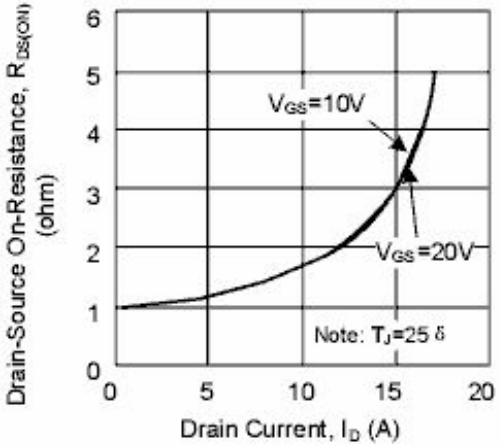
On-State Characteristics



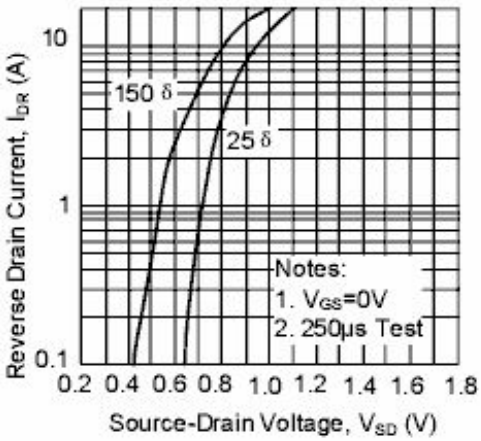

Transfer Characteristics



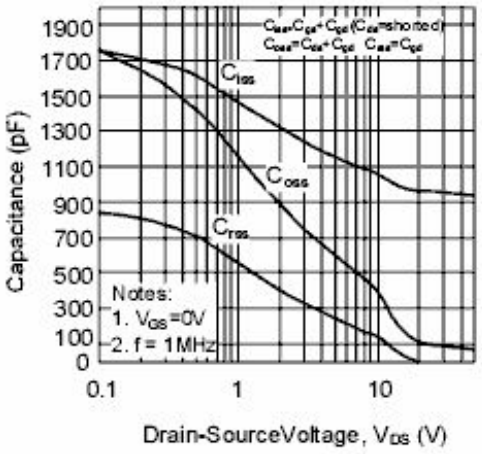

On-Resistance Variation vs. Drain Current and Gate Voltage



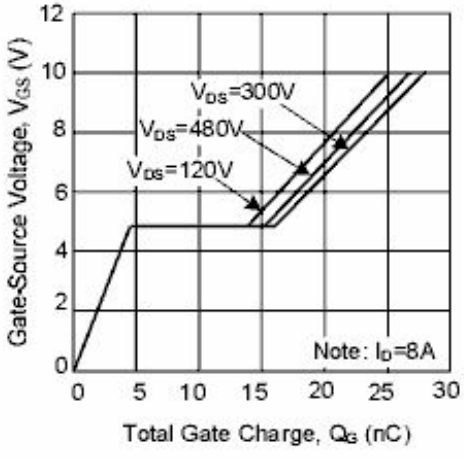

Body Diode Forward Voltage vs. Source Current



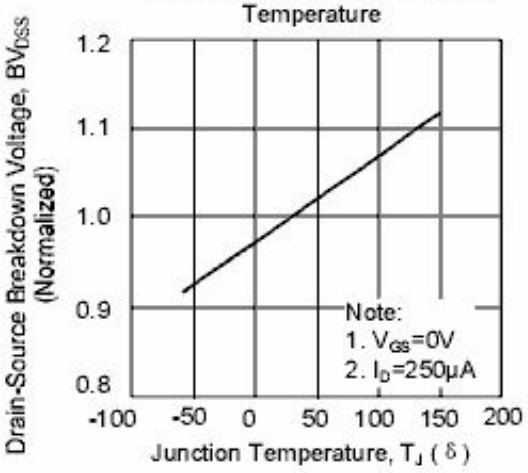

Capacitance Characteristics (Non-Repetitive)



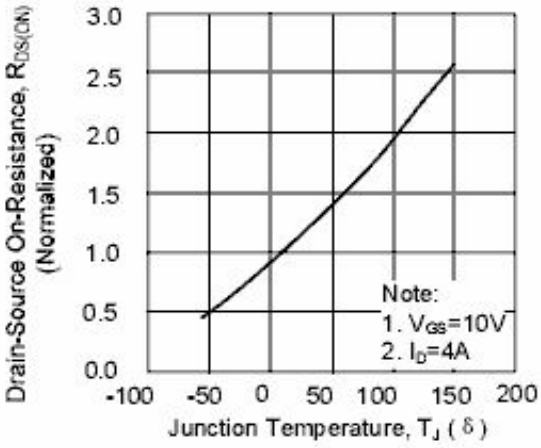

Gate Charge Characteristics



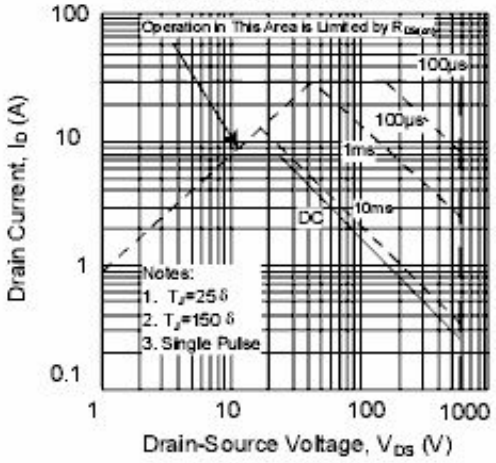
Breakdown Voltage Variation vs. Temperature



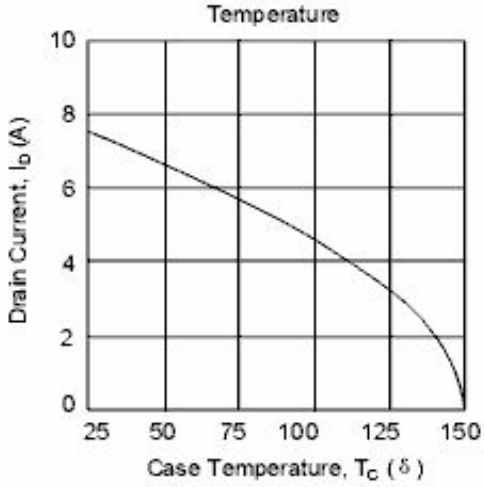

On-Resistance Junction Temperature



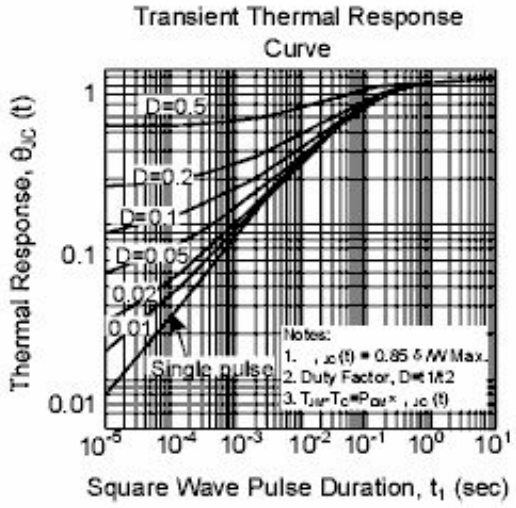

Maximum Safe Operating Area




Maximum Drain Current vs. Case Temperature




Transient Thermal Response Curve



**Test circuits and waveforms**

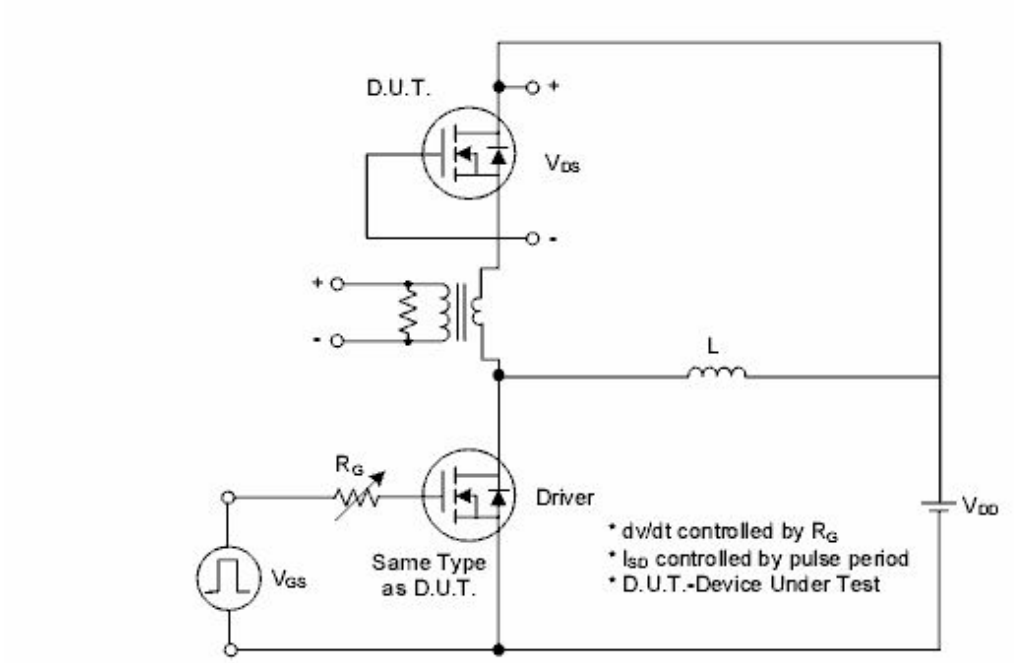



Fig. 1A Peak Diode Recovery dv/dt Test Circuit

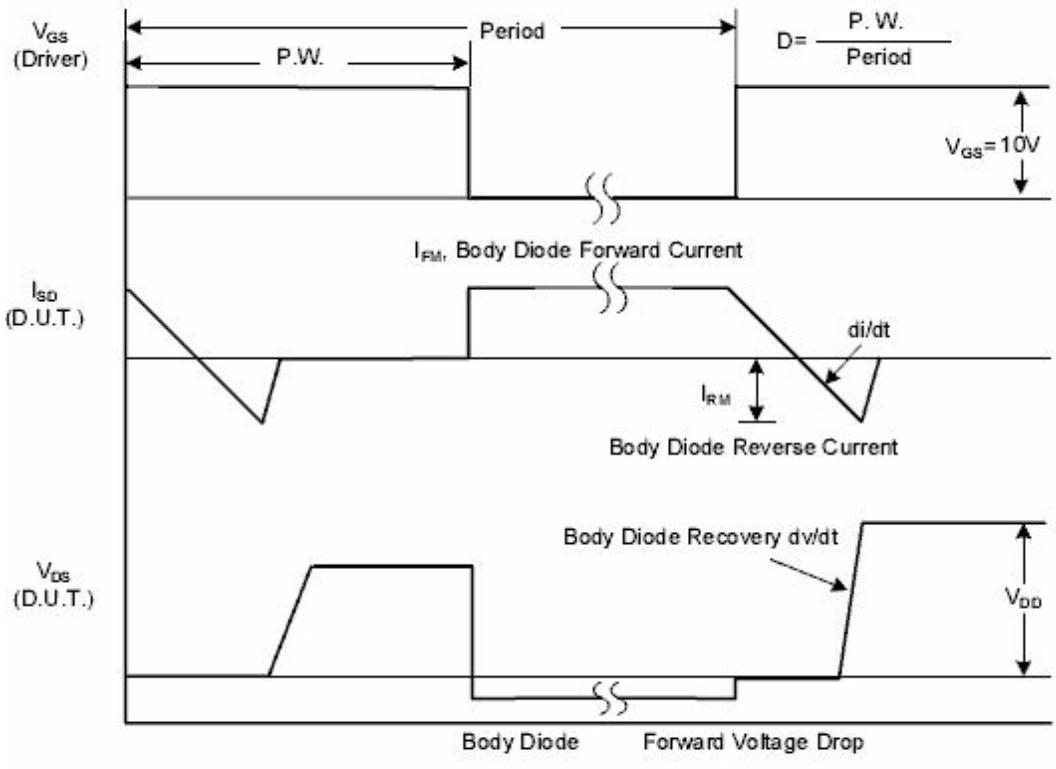



Fig. 1B Peak Diode Recovery dv/dt Waveforms

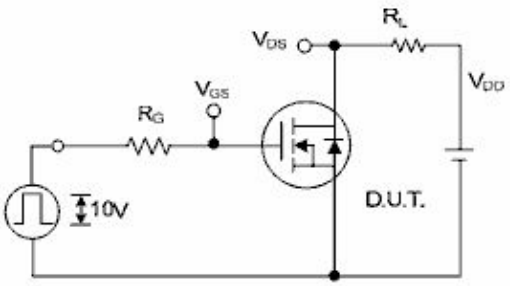



Fig. 2A Switching Test Circuit

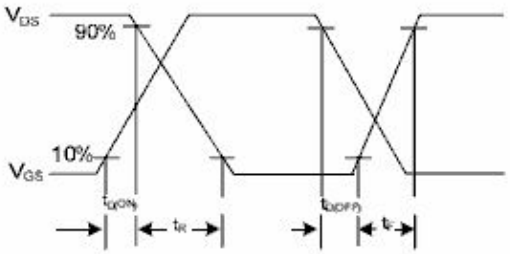



Fig. 2B Switching Waveforms

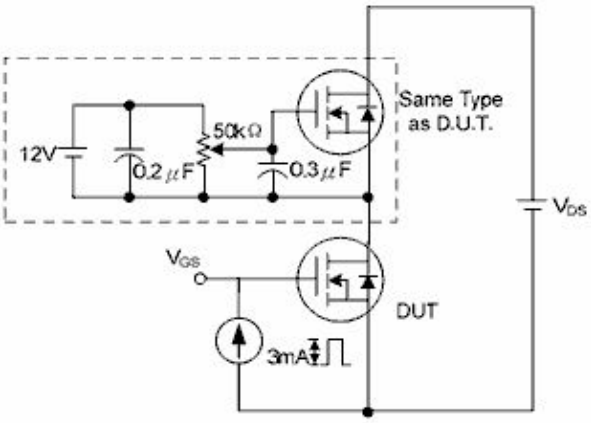



Fig. 3A Gate Charge Test Circuit

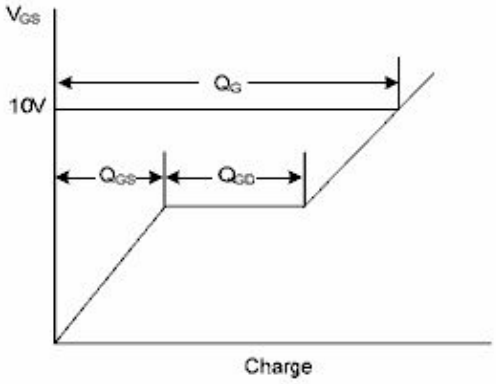



Fig. 3B Gate Charge Waveform

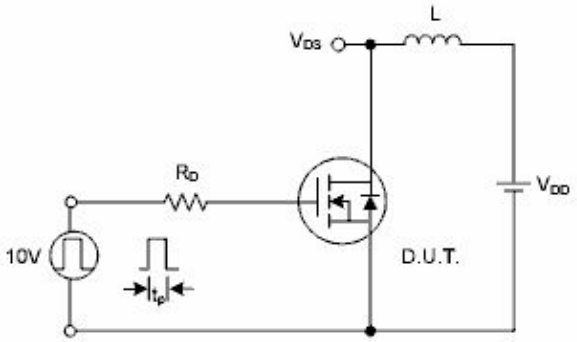



Fig. 4A Unclamped Inductive Switching Test Circuit

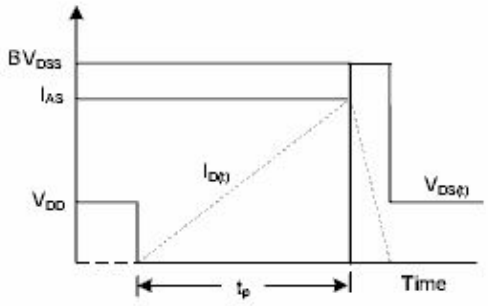



Fig. 4B Unclamped Inductive Switching Waveforms

**Mechanical Dimensions**