

TS4N65

4.0Amps, 650V N-Channel Power Mosfet

DRAWING

Features

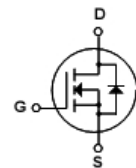
- ◆ 4.0A,650V, $R_{DS(ON)}=2.5\Omega@V_{GS}=10V$
- ◆ Low gate charge
- ◆ Fast switching capability
- ◆ Avalanche energy specified
- ◆ Improved dv/dt capability

General Description

- ◆ Package: ITO-220AB NG
- ◆ The TS4N65 N-Channel enhancement mode silicon gate power MOSFET is designed for high voltage, high speed power switching applications such as switching regulators, switching converters, solenoid, motor drivers, relay drivers.



G D S



Absolute Maximum Ratings

| Symbol | Parameter | Spec | Units |
|-----------|--|-------------|------------|
| V_{DSS} | Drain-Source Voltage | 650 | V |
| I_D | Drain Current -Continuous($T_c=25^\circ C$) | 4.0 | A |
| | Drain Current -Continuous($T_c=100^\circ C$) | 2.5 | |
| I_{DM} | Drain Current -Pulsed (Note 2) | 16 | A |
| V_{GSS} | Gate-Source Voltage | ± 30 | V |
| P_D | Power Dissipation($T_c=25^\circ C$) | 38 | W |
| E_{AS} | Single Pulsed Avalanche Energy | 260 | mJ |
| I_{AR} | Avalanche Current | 4 | A |
| E_{AR} | Repetitive Avalanche Energy | 10.6 | mJ |
| dv/dt | Peak Diode Recovery dv/dt | 5.5 | V/ns |
| T_j | Junction Temperature | +150 | $^\circ C$ |
| T_{opr} | Operating Temperature Range | -55 to +150 | $^\circ C$ |
| T_{stg} | Storage Temperature | -55 to +150 | $^\circ C$ |

Note: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Pulse width limited by $T_{J(MAX)}$
3. $L = 16.8mH$, $I_{AS} = 5A$, $V_{DD} = 50V$, $R_G = 25 \Omega$, Starting $T_J = 25^\circ C$
4. $I_{SD} \leq 4.5A$, $di/dt \leq 200A/\mu s$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ C$

Thermal Characteristics

| Symbol | Parameter | Typ | Max | Units |
|-----------------|---|-----|------|--------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case | - | 3.28 | $^\circ C/W$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | - | 62.5 | $^\circ C/W$ |

Electrical Characteristics(Tc=25°C 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/TJ} | Breakdown Voltage Temperature Coefficient | ID=250uA, Referenced to 25°C | — | 0.6 | — | V/°C |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} =650V, V _{GS} =0V | — | — | 10 | uA |
| I _{GSSF} | Gate-Body Leakage Current Forward | V _{gs} =30V, V _{ds} =0V | — | — | 100 | nA |
| I _{GSSR} | Gate-Body Leakage Current Reverse | V _{gs} =-30V, V _{ds} =0V | — | — | -100 | nA |

On Characteristics

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---------------------|-----------------------------------|--|-----|-----|-----|-------|
| V _{GSTH} | Gate Threshold Voltage | V _{DS} =V _{GS} , I _D =250uA | 2.0 | — | 4.0 | V |
| R _{DS(on)} | Static Drain-Source On-Resistance | V _{GS} =10V, I _D =2.2A | — | 2.4 | 2.6 | Ω |

Dynamic Characteristics

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|------------------|------------------------------|---|-----|-----|-----|-------|
| C _{JSS} | Input Capacitance | V _{DS} =25V, V _{GS} =0V, f=1.0MHz | — | 520 | 670 | pF |
| C _{OSS} | Output Capacitance | | — | 70 | 90 | pF |
| C _{rss} | Reverse Transfer Capacitance | | — | 8 | 11 | pF |

Switching Characteristics

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|-------------------|---------------------|---|-----|-----|-----|-------|
| t _{don} | Turn-On Delay Time | V _{DD} =325V I _D =4.0A R _G =25Ω (Note 1.2) | — | 13 | 35 | ns |
| t _r | Turn-On Rise Time | | — | 45 | 100 | ns |
| t _{doff} | Turn-Off Delay Time | | — | 35 | 60 | ns |
| t _f | Turn-Off Fall Time | | — | 25 | — | ns |
| Q _g | Total Gate Charge | V _{DS} =520V | — | 15 | 20 | nc |
| Q _{gs} | Gate-Source Charge | I _D =4.0A | — | 3.4 | — | nc |
| Q _{gd} | Gate-Drain Charge | V _{GS} =10V | — | 7.1 | — | nc |

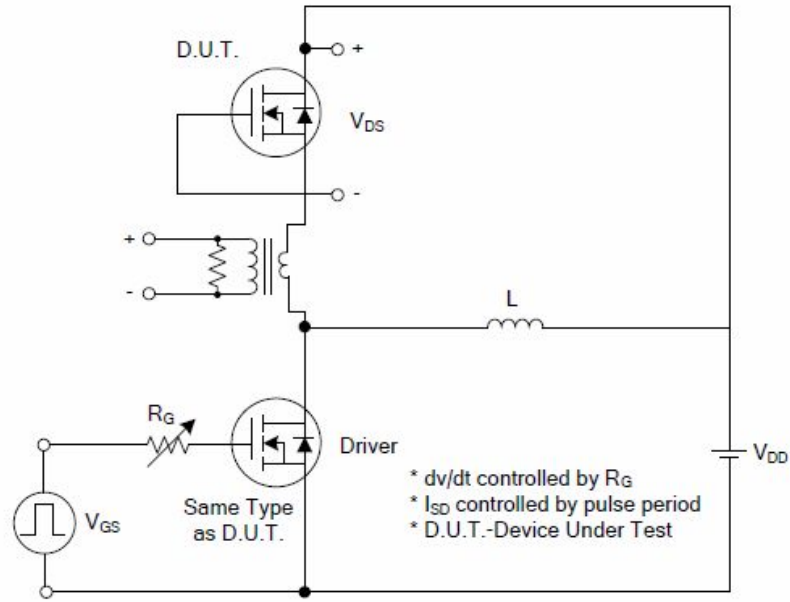
Drain-Source Diode Characteristics and Maximum Ratings

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|-----------------|---|---|-----|-----|------|-------|
| I _s | Maximum Continuous Drain-source diode forward current | | — | — | 4.4 | A |
| I _{sm} | Maximum pulsed drain-source diode forward current | | — | — | 17.6 | A |
| V _{sd} | Drain-source diode forward Voltage | V _{GS} =0V, I _S =4A | — | — | 1.4 | V |
| T _{rr} | Reverse Recovery Time | V _{GS} =0V, I _S =4A | — | 250 | — | ns |
| Q _{rr} | Reverse Recovery charge | dif/dt=100A/us (Note 1) | — | 1.5 | — | uc |

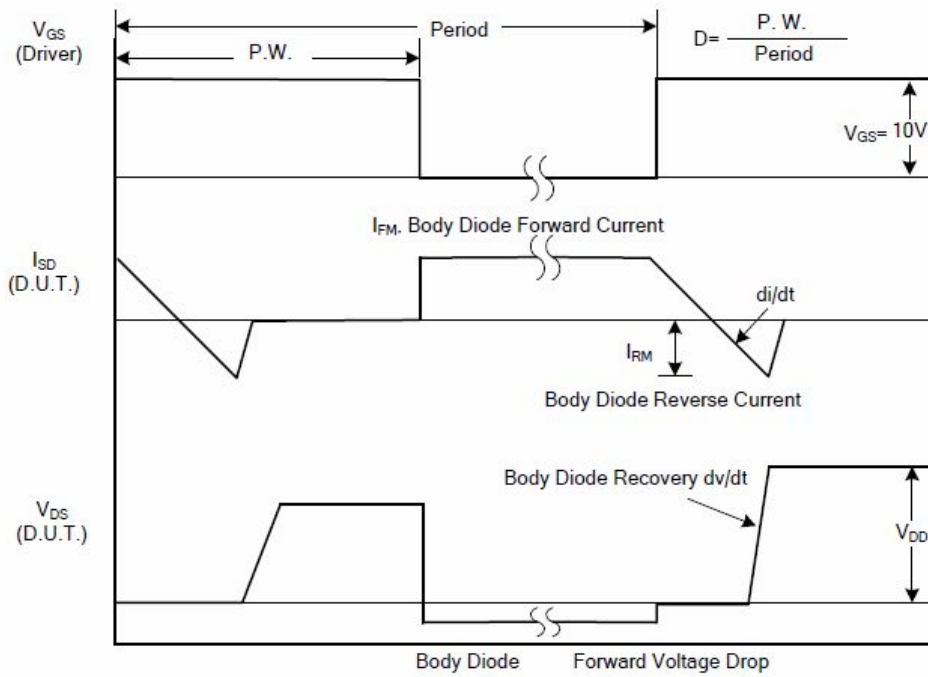
Notes : a. pulse test pulse width 300 us, duty cycle 2% ,Guaranteed by design, not subject to production testing.

b. HOMSEMI reserves the right to improve product design functions and reliability without notice.

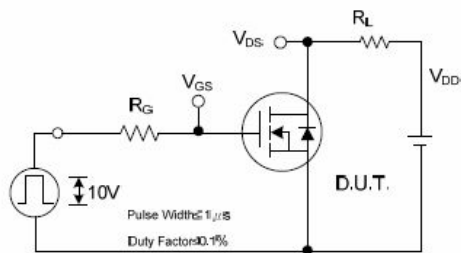
Test circuits and waveforms



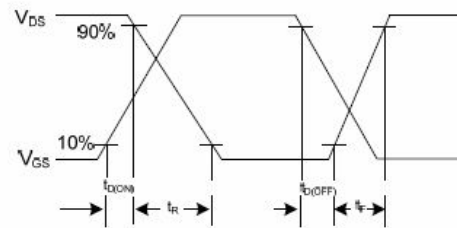
Peak Diode Recovery dv/dt Test Circuit



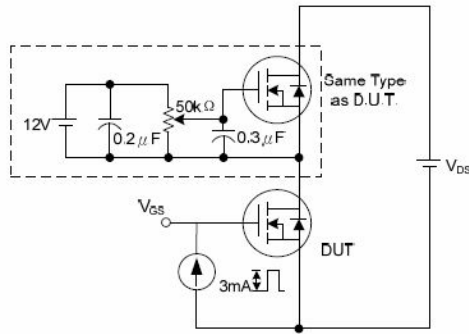
Peak Diode Recovery dv/dt Waveforms



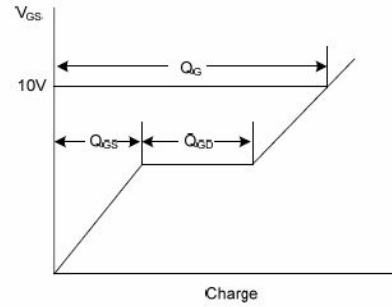
Switching Test Circuit



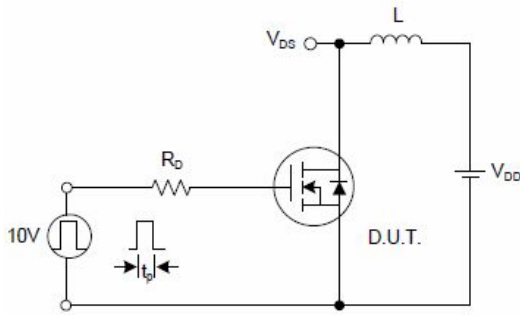
Switching Waveforms



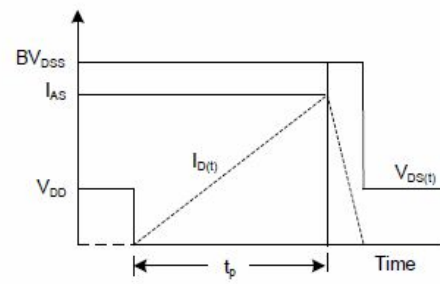
Gate Charge Test Circuit



Gate Charge Waveform

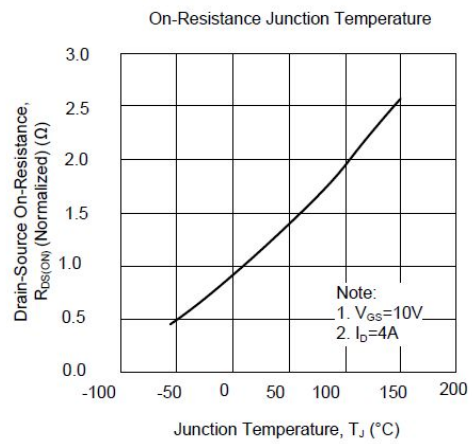
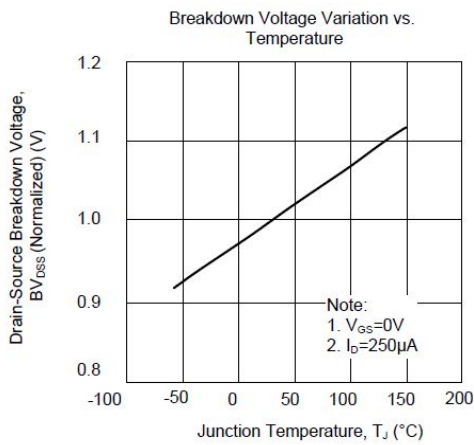


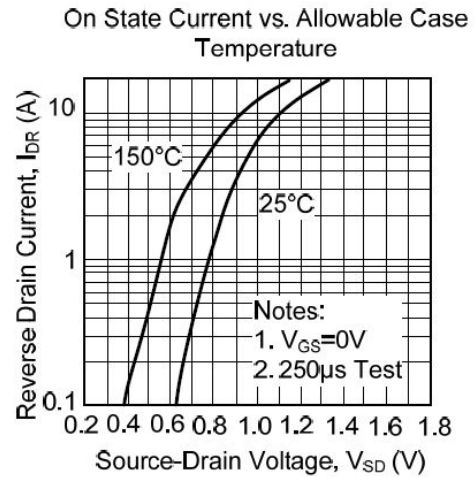
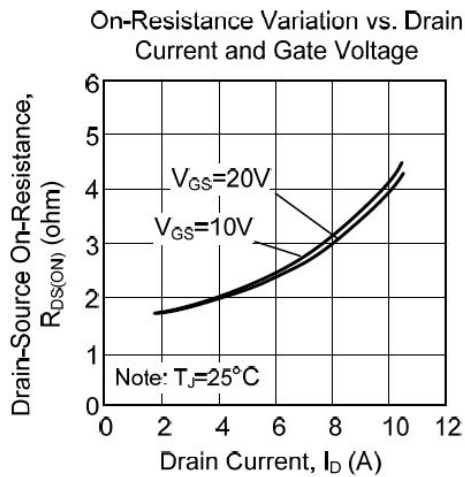
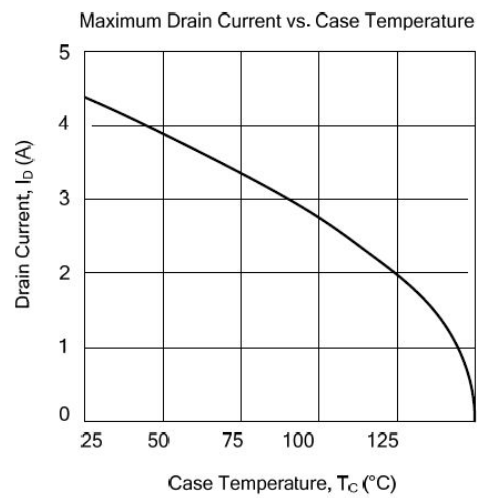
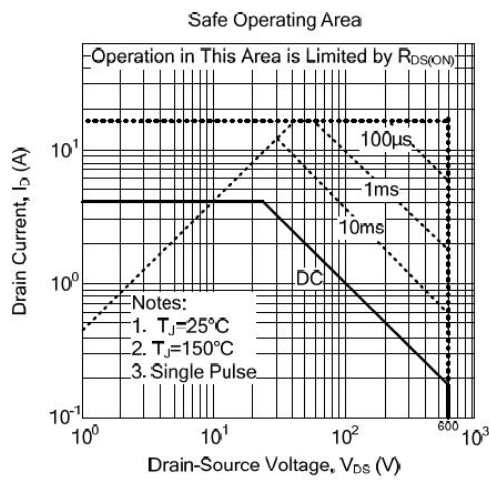
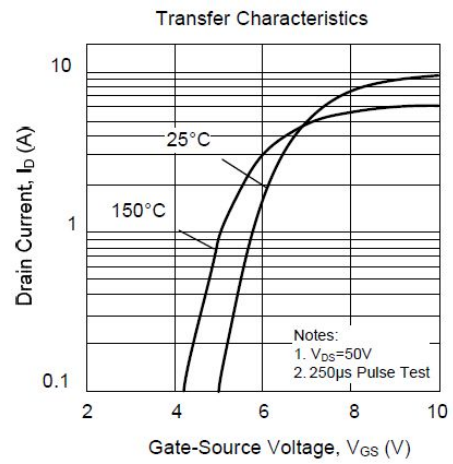
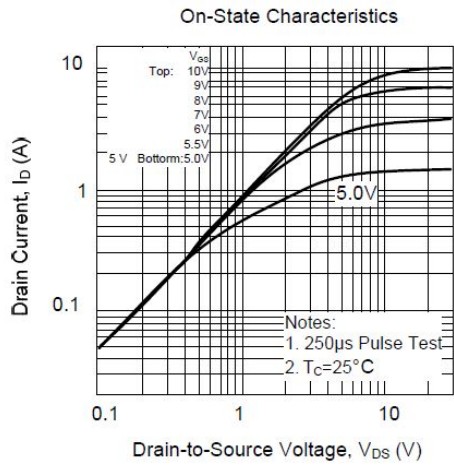
Unclamped Inductive Switching Test Circuit

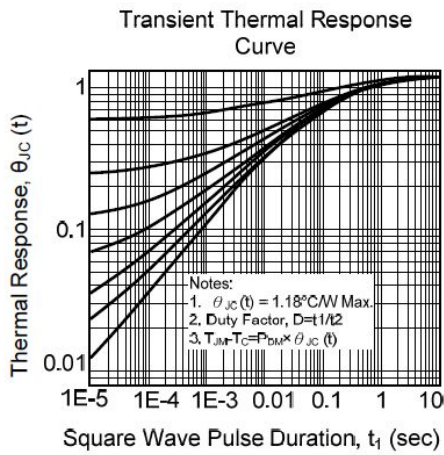
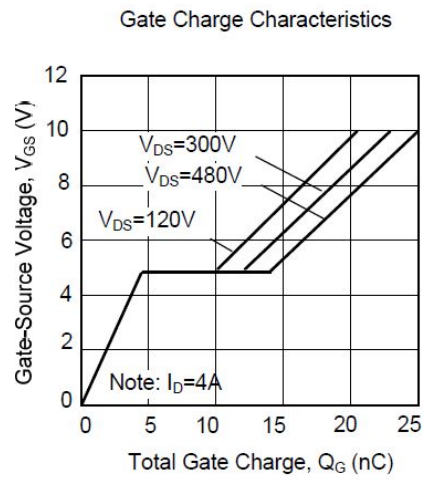
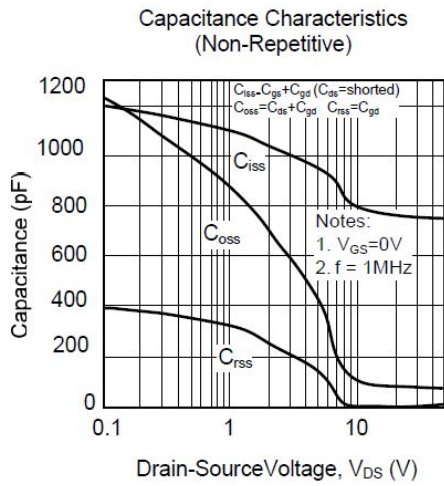


Unclamped Inductive Switching Waveforms

Typical Characteristics







Mechanical Dimensions

