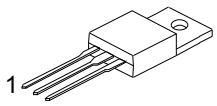
# NJ4N80 POWER MOSFET

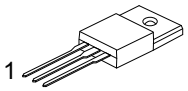
## 4.0A 800V N-CHANNEL POWER MOSFET

### ■ DESCRIPTION

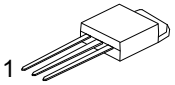
The NJ4N80 is a N-channel mode power MOSFET using advanced technology to provide costomers planar stripe and DMOS technology. This technology is specialized in allowing a minimum on-state resistance, and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.



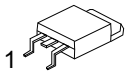

TO-220




TO-220F




TO-251

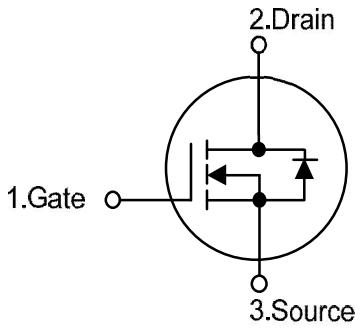



TO-252

### ■ FEATURES

* $V_{DS}$ = 800V
* $I_D$ = 4.0A
* $R_{DS(ON)}$ =3Ω@$V_{GS}$ = 10V.
* High switching speed
* Improved dv/dt capability
* 100% avalanche tested

### ■ SYMBOL




### ■ ORDERING INFORMATION

| Ordering Number | Package | Pin Assignment | | | Packing |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | |
| NJ4N80-LI | TO-220 | G | D | S | Tape Box |
| NJ4N80-BL | TO-220 | G | D | S | Bulk |
| NJ4N80F-LI | TO-220F | G | D | S | Tube |
| NJ4N80A-LI | TO-251 | G | D | S | Tube |
| NJ4N80D-TR | TO-252 | G | D | S | Tape Ree |
| NJ4N80D-LI | TO-252 | G | D | S | Tube |

Note: Pin Assignment: G: Gate D: Drain S: Source

# NJ4N80 POWER MOSFET

## ■ ABSOLUTE MAXIMUM RATINGS ($T_C$=25°C, unless otherwise specified)

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DSS}$ | 800 | V |
| Gate-Source Voltage | | $V_{GSS}$ | ±30 | V |
| Drain Current | Continuous | $I_D$ | 4.0 | A |
| | Pulsed (Note 2) | $I_{DM}$ | 16 | A |
| Avalanche Energy | Single Pulsed (Note 3) | $E_{AS}$ | 460 | mJ |
| | Repetitive (Note 2) | $E_{AR}$ | 13 | mJ |
| Peak Diode Recovery dv/dt (Note 4) | | dv/dt | 4.0 | V/ns |
| Power Dissipation | TO-220 | $P_D$ | 106 | W |
| | TO-220F | | 36 | W |
| | TO-251 | | 50 | W |
| | TO-252 | | 50 | W |
| Junction Temperature | | $T_J$ | +150 | °C |
| Storage Temperature | | $T_{STG}$ | -55~+150 | °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. Repetitive Rating: Pulse width limited by maximum junction temperature
3. L=57mH, $I_{AS}$=4A, $V_{DD}$= 50V, $R_G$=25Ω, Starting $T_J$=25°C
4. $I_{SD}$ ≤4A, di/dt ≤200A/μs, $V_{DD}$ ≤$BV_{DSS}$, Starting $T_J$=25°C

## ■ THERMAL DATA

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|
| Junction to Ambient | TO-220<br>TO-220F | $\theta_{JA}$ | 62.5 | °C/W |
| | TO-251 | | 110 | °C/W |
| | TO-252 | | 110 | °C/W |
| Junction to Case | TO-220 | $\theta_{JC}$ | 1.18 | °C/W |
| | TO-220F | | 3.47 | °C/W |
| | TO-251 | | 2.5 | °C/W |
| | TO-252 | | 2.5 | °C/W |

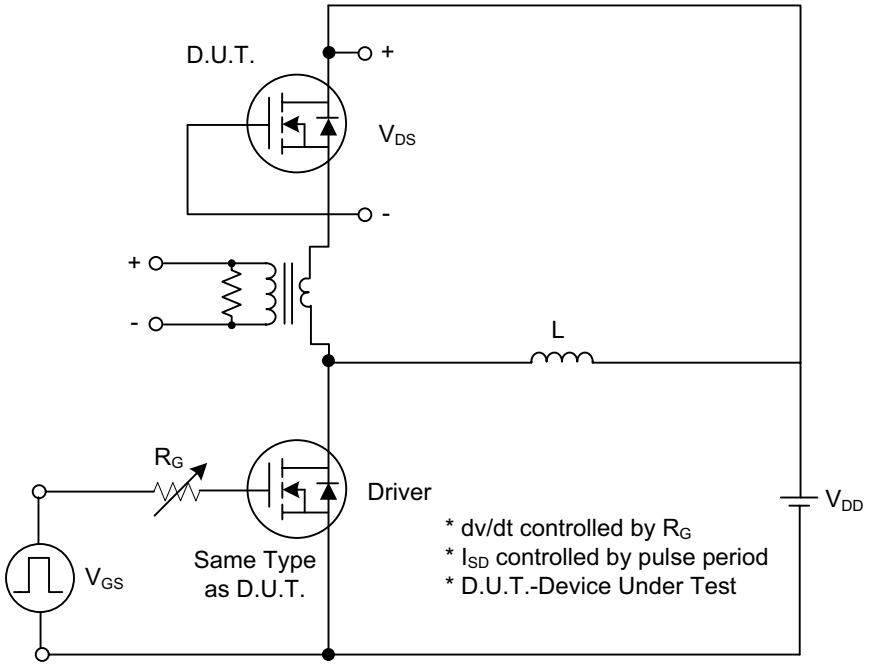
# NJ4N80 POWER MOSFET

## ■ ELECTRICAL CHARACTERISTICS ($T_C$=25°C, unless otherwise specified)

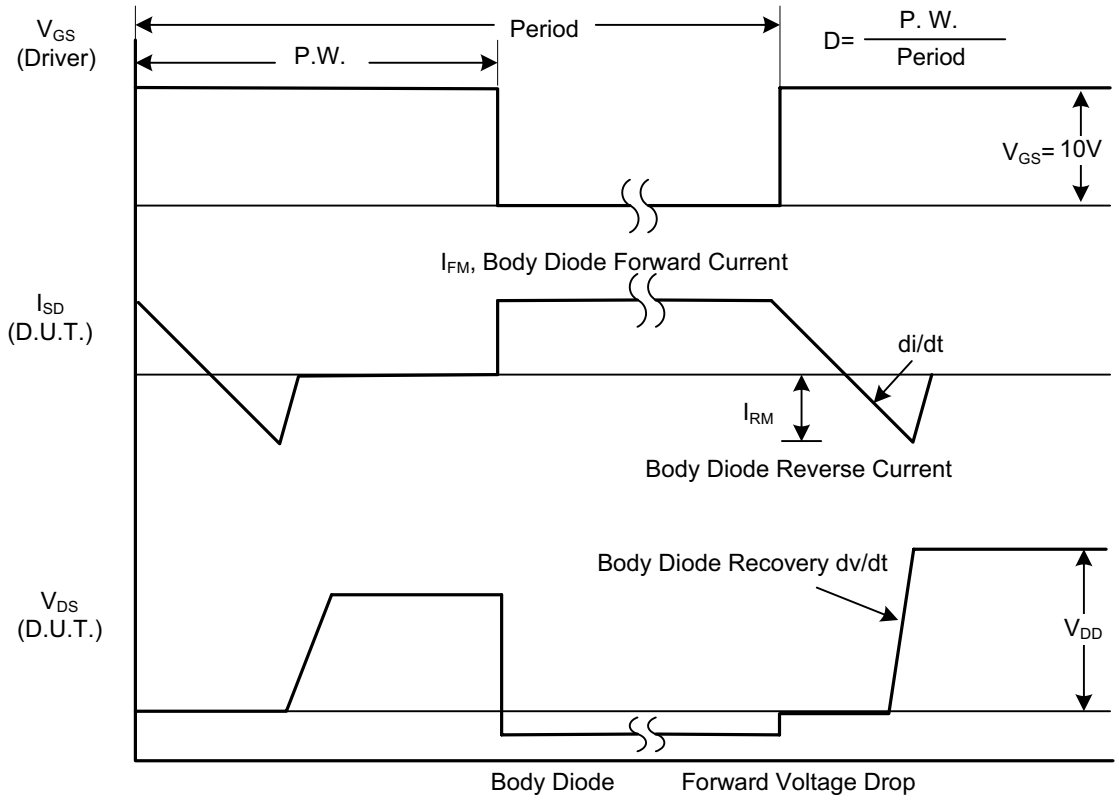
| PARAMETER | | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | | |
| Drain-Source Breakdown Voltage | | $BV_{DSS}$ | $V_{GS}$=0V, $I_D$=250μA | 800 | | | V |
| Breakdown Voltage Temperature Coefficient | | $\Delta BV_{DSS}/\Delta T_J$ | $I_D$=250μA,Referenced to 25°C | | 950 | | mV/°C |
| Drain-Source Leakage Current | | $I_{DSS}$ | $V_{DS}$=800V, $V_{GS}$=0V | | | 10 | μA |
| | | | $V_{DS}$=640V, $T_C$=125°C | | | 100 | μA |
| Gate-Source Leakage Current | Forward | $I_{GSS}$ | $V_{DS}$=0V ,$V_{GS}$=30V | | | 100 | nA |
| | Reverse | | $V_{DS}$=0V ,$V_{GS}$=-30V | | | -100 | nA |
| **ON CHARACTERISTICS** | | | | | | | |
| Gate Threshold Voltage | | $V_{GS(TH)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250μA | 3.0 | | 5.0 | V |
| Drain-Source On-State Resistance | | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=2A | | 2.3 | 3.0 | Ω |
| **DYNAMIC PARAMETERS** | | | | | | | |
| Input Capacitance | | $C_{ISS}$ | $V_{DS}$=25V,$V_{GS}$=0V,f=1.0MHz | | 680 | 880 | pF |
| Output Capacitance | | $C_{OSS}$ | | | 75 | 100 | pF |
| Reverse Transfer Capacitance | | $C_{RSS}$ | | | 8.6 | 12 | pF |
| **SWITCHING PARAMETERS** | | | | | | | |
| Total Gate Charge | | $Q_G$ | $V_{DS}$=640V, $V_{GS}$=10V, $I_D$=4A (Note 1,2) | | 19 | 25 | nC |
| Gate-Source Charge | | $Q_{GS}$ | | | 4.2 | | nC |
| Gate-Drain Charge | | $Q_{GD}$ | | | 9.1 | | nC |
| Turn-ON Delay Time | | $t_{D(ON)}$ | $V_{DD}$=400V, $I_D$=4A, $R_G$=25Ω (Note 1,2) | | 16 | 40 | ns |
| Turn-ON Rise Time | | $t_R$ | | | 45 | 100 | ns |
| Turn-OFF Delay Time | | $t_{D(OFF)}$ | | | 35 | 80 | ns |
| Turn-OFF Fall Time | | $t_F$ | | | 35 | 80 | ns |
| **SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS** | | | | | | | |
| Maximum Body-Diode Continuous Current | | $I_S$ | | | | 4 | A |
| Maximum Body-Diode Pulsed Current | | $I_{SM}$ | | | | 16 | A |
| Drain-Source Diode Forward Voltage | | $V_{SD}$ | $I_S$ =4A, $V_{GS}$=0V | | | 1.4 | V |
| Body Diode Reverse Recovery Time | | $t_{rr}$ | $V_{GS}$=0V, $I_S$=4A, $dI_F/dt$=100A/μs (Note 1) | | 575 | | ns |
| Body Diode Reverse Recovery Charge | | $Q_{RR}$ | | | 3.65 | | μC |

Note: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%
2. Essentially independent of operating temperature

## ■ TEST CIRCUITS AND WAVEFORMS

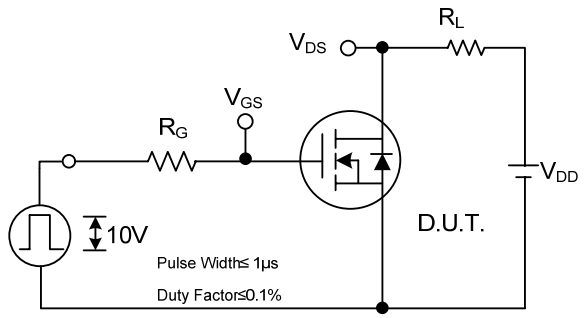



**Peak Diode Recovery dv/dt Test Circuit**

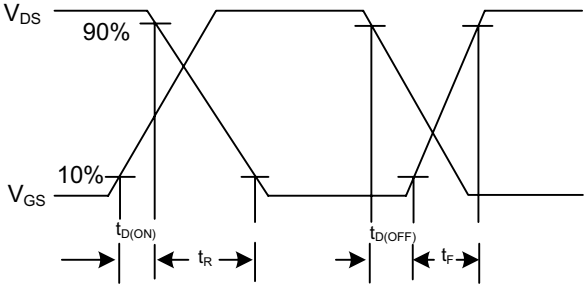



**Peak Diode Recovery dv/dt Waveforms**

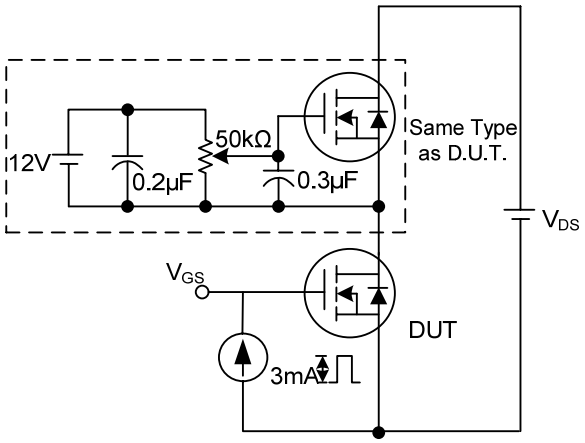
## ■ TEST CIRCUITS AND WAVEFORMS(Cont.)



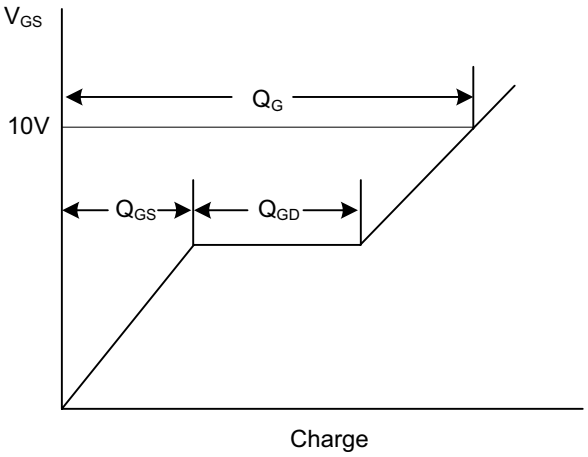

**Switching Test Circuit**



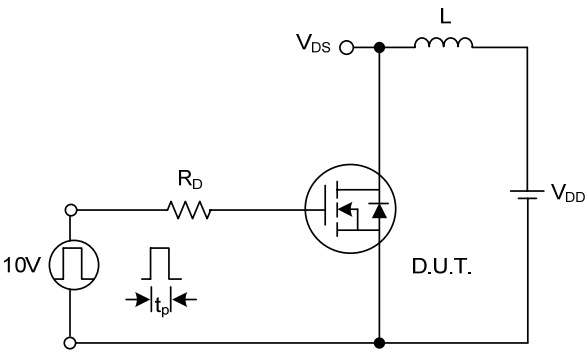

**Switching Waveforms**



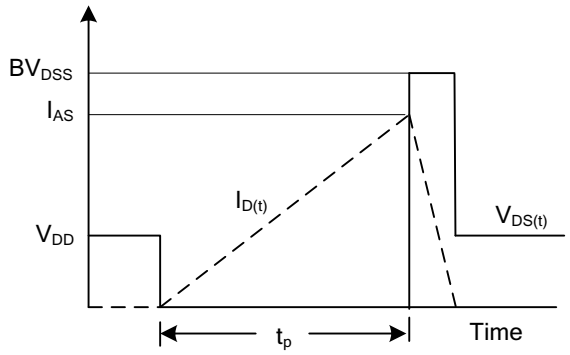

**Gate Charge Test Circuit**




**Gate Charge Waveform**




**Unclamped Inductive Switching Test Circuit**




**Unclamped Inductive Switching Waveforms**

## ■ TYPICAL CHARACTERISTICS