Maplesemi

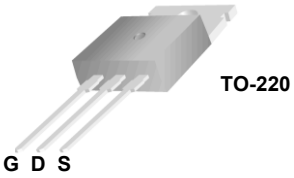
# MSP120N08G
## 80V N-Channel MOSFET

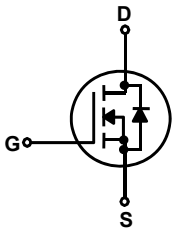
### General Description

This Power MOSFET is produced using Maple semi's advanced technology.
which provides high performance in on-state resistance, fast switching performance and excellent quality.
MSP120N08G suitable device forSynchronous Rectification For Server and general purpose applications.

### Features

- 120A, 80V, $R_{DS(TYP)}$ = 5.5mΩ@$V_{GS}$ = 10 V
- Low gate charge ( typical 59 nC)
- High ruggedness
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability




### Absolute Maximum Ratings

$T_C$ = 25°C unless otherwise noted

| Symbol | Parameter | MSP120N08G | Units |
|---|---|---|---|
| $V_{DSS}$ | Drain-Source Voltage | 80 | V |
| $I_D$ | Drain Current - Continuous ($T_C$ = 25℃) | 120 | A |
| | Drain Current - Continuous ($T_C$ = 100℃) | 67 | A |
| $I_{DM}$ | Drain Current - Pulsed (Note 1) | 420 | A |
| $V_{GSS}$ | Gate-Source Voltage | ±20 | V |
| EAS | Single Pulsed Avalanche Energy (Note 2) | 144.5 | mJ |
| $I_{AR}$ | Avalanche Current (Note 1) | 120 | A |
| $P_D$ | Power Dissipation ($T_C$ = 25℃) | 157 | W |
| | - Derate above 25℃ | 1.26 | W/℃ |
| $T_J$, $T_{STG}$ | Operating and Storage Temperature Range | -55 to +150 | ℃ |
| $T_L$ | Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds | 300 | ℃ |

* Drain current limited by maximum junction temperature.

### Thermal Characteristics

| Symbol | Parameter | MSP120N08G | Units |
|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case | 0.8 | ℃/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | 62.5 | ℃/W |

## Electrical Characteristics

$T_C$ = 25°C unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$ = 0 V, $I_D$ = 250 uA | 80 | -- | -- | V |
| $\triangle BV_{DSS}$ / $\triangle T_J$ | Breakdown Voltage Temperature Coefficient | $I_D$ = 250 uA, Referenced to 25℃ | -- | 0.1 | -- | V/℃ |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 64 V, $V_{GS}$ = 0 V | -- | -- | 1 | uA |
| | | $V_{DS}$ = 64 V, $T_C$ = 125℃ | -- | -- | 10 | uA |
| $I_{GSSF}$ | Gate-Body Leakage Current, Forward | $V_{GS}$ = 20 V, $V_{DS}$ = 0 V | -- | -- | 100 | nA |
| $I_{GSSR}$ | Gate-Body Leakage Current, Reverse | $V_{GS}$ = -20 V, $V_{DS}$ = 0 V | -- | -- | -100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 uA | 2.0 | -- | 4.0 | V |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance | $V_{GS}$ = 10 V, $I_D$ = 60A | -- | 5.5 | 7.0 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = 10 V, $I_D$ = 60 A (Note 3) | -- | 47 | -- | S |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 40 V, $V_{GS}$ = 0 V, f = 1.0 MHz | -- | 3841 | -- | pF |
| $C_{oss}$ | Output Capacitance | | -- | 652 | -- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | -- | 34 | -- | |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{Ds}$ = 40 V, $I_D$ = 60 A, $R_G$ = 3.0 Ω (Note3, 4) | -- | 15.6 | -- | ns |
| $t_r$ | Turn-On Rise Time | | -- | 32.7 | -- | |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 24.2 | -- | |
| $t_f$ | Turn-Off Fall Time | | -- | 15.1 | -- | |
| $Q_g$ | Total Gate Charge | $V_{DS}$ = 40 V, $I_D$ = 60 A, $V_{GS}$ = 10 V (Note 3, 4) | -- | 59.4 | -- | nC |
| $Q_{gs}$ | Gate-Source Charge | | -- | 16.5 | -- | |
| $Q_{gd}$ | Gate-Drain Charge | | -- | 12.3 | -- | |
| **Drain-Source Diode Characteristics and Maximum Ratings** | | | | | | |
| $V_{SD}$ | Drain-Source Diode Forward Voltage | $V_{GS}$ = 0 V, $I_S$ = 60 A | -- | 0.9 | 1.2 | V |
| $t_{rr}$ | Reverse Recovery Time | $V_{GS}$ = 0 V, $I_S$ = 60 A, $dI_F$ / dt = 100 A/us (Note 3) | -- | 64.3 | -- | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | -- | 152.7 | -- | uC |

**Notes:**

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $I_{AS}$ = 17A,L=1.0mH,$V_{GS}$ = 10V, Starting $T_J$ = 25°C
3. Pulse Test : Pulse width ≤ 300us, Duty cycle ≤ 2%
4. Essentially independent of operating temperature

## Typical Characteristics

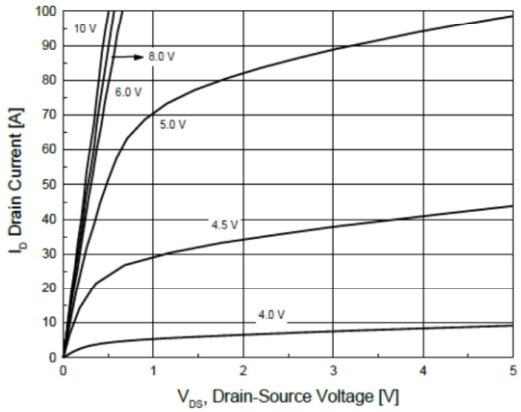



Figure 1. On-Region Characteristics

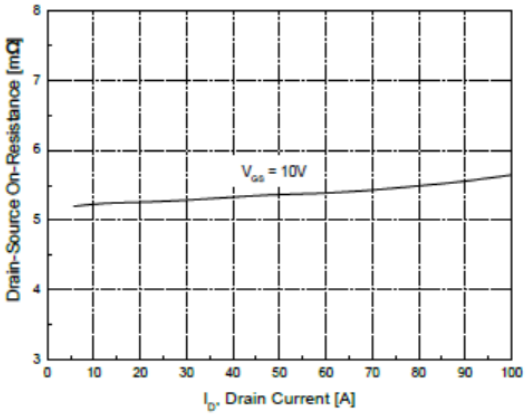



Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

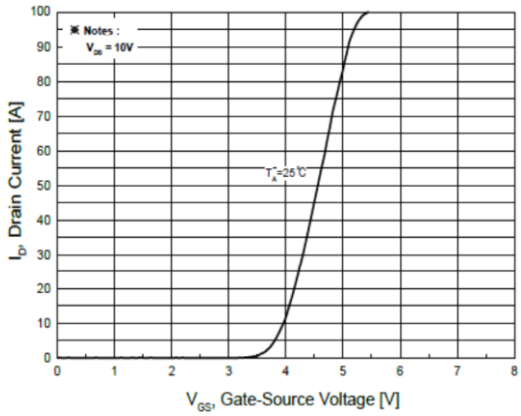



Figure 3. Transfer Characteristics

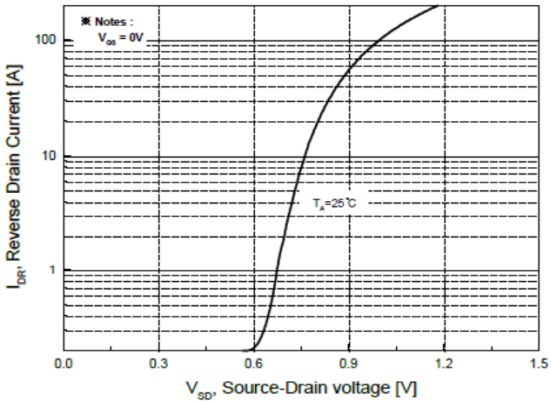



Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

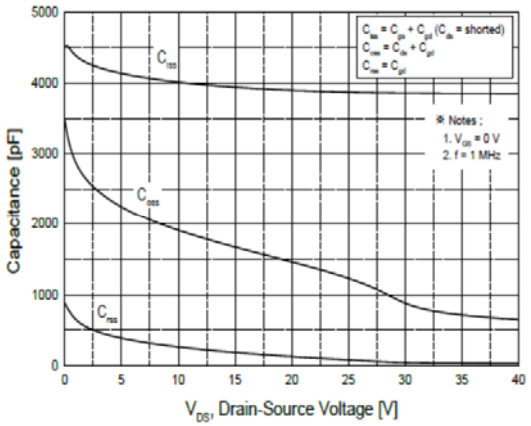



Figure 5. Capacitance Characteristics

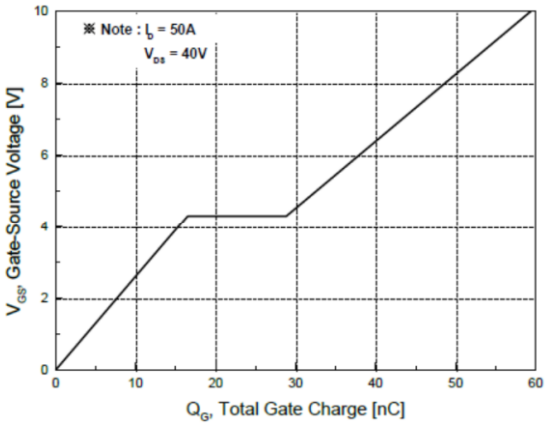



Figure 6. Gate Charge Characteristics

## Typical Characteristics (Continued)

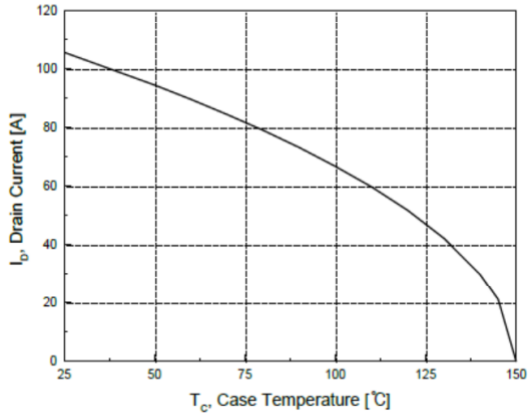



**Figure 7. Maximum Drain Current VS Case Temperature**

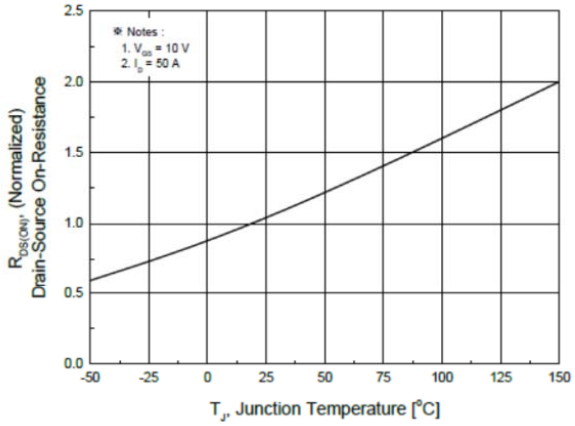



**Figure 8. On-Resistance Variation vs Temperature**

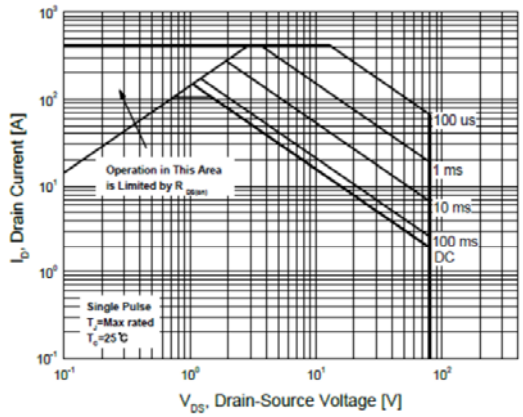



**Figure 9. Maximum Safe Operating Area**

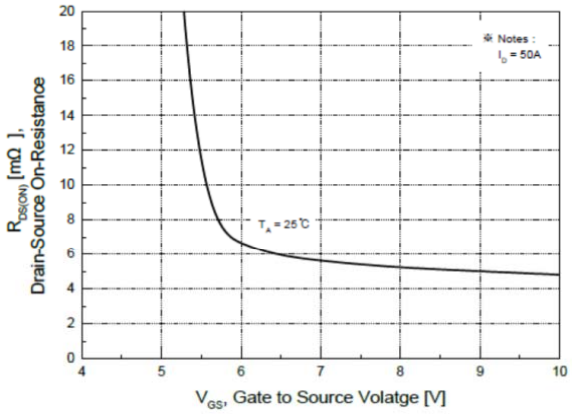



**Figure 10.On-Resistance Variation with Gate to Source Voltage**

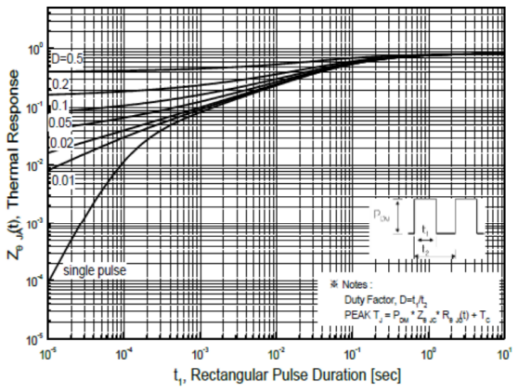
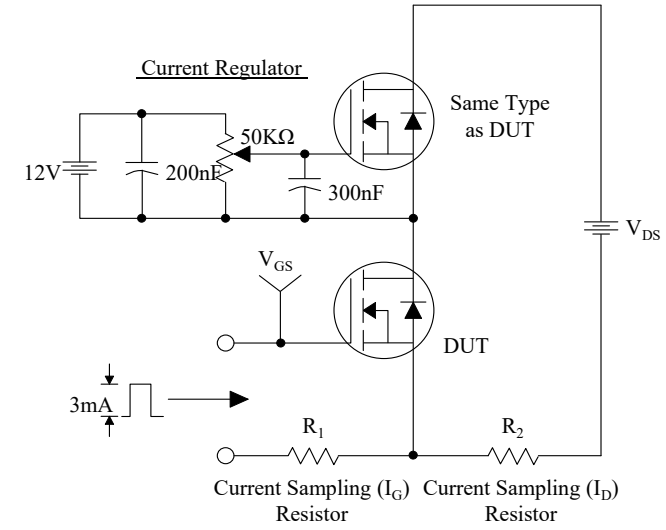
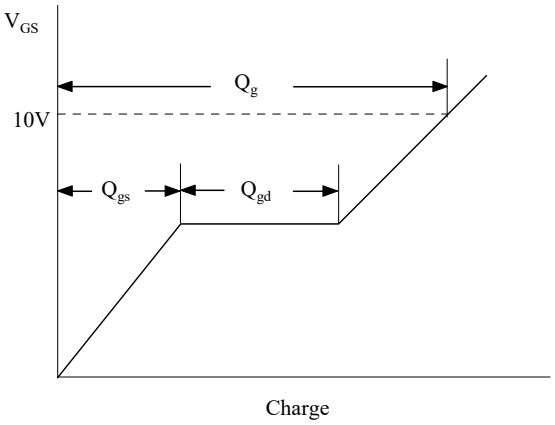


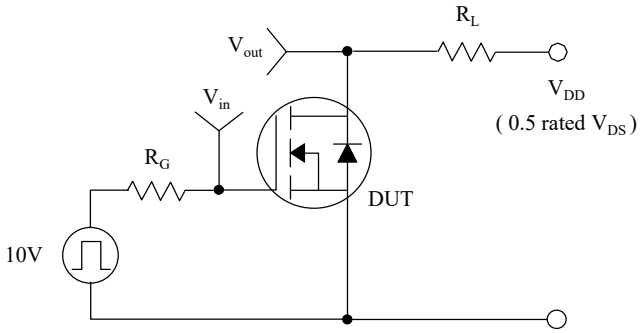

**Figure 11.Transient Thermal Response Curve**

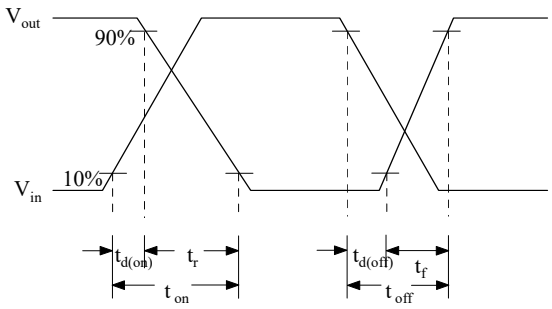
## Gate Charge Test Circuit & Waveform



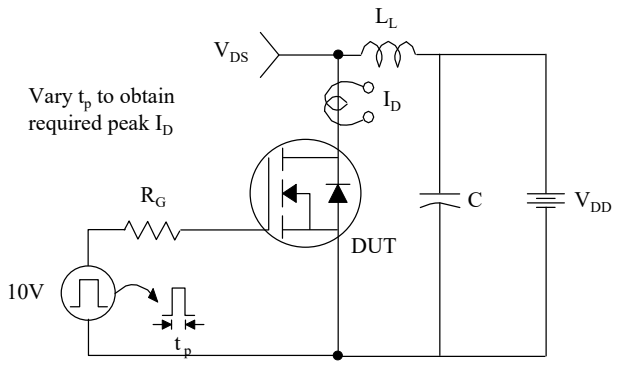




## Resistive Switching Test Circuit & Waveforms

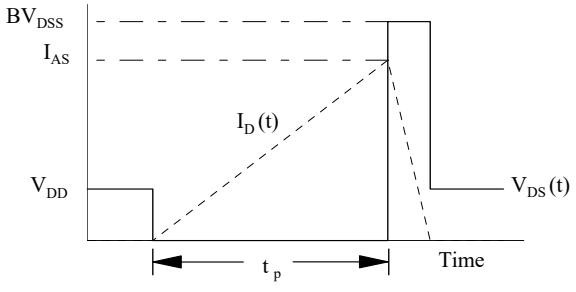



## Unclamped Inductive Switching Test Circuit & Waveforms




$$E_{AS} = \frac{1}{2} L_L I_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$



## Peak Diode Recovery dv/dt Test Circuit & Waveforms