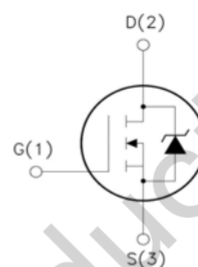
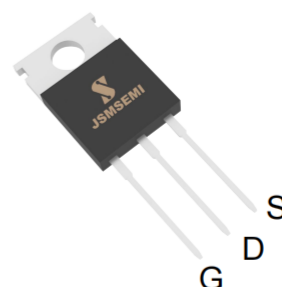


## FEATURES

- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

## APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)



1. Gate (G)
2. Drain (D)
3. Source (S)

### Device Marking and Package Information

| Device   | Package | Marking  |
|----------|---------|----------|
| MTP60N05 | TO-220  | MTP60N05 |

### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ , unless otherwise noted

| Parameter                                        | Symbol         | Value    | Unit             |
|--------------------------------------------------|----------------|----------|------------------|
|                                                  |                | TO-220   |                  |
| Drain-Source Voltage ( $V_{GS} = 0V$ )           | $V_{DSS}$      | 60       | V                |
| Continuous Drain Current                         | $I_D$          | 110      | A                |
| Pulsed Drain Current (note1)                     | $I_{DM}$       | 440      | A                |
| Gate-Source Voltage                              | $V_{GSS}$      | $\pm 20$ | V                |
| Single Pulse Avalanche Energy (note2)            | $E_{AS}$       | 653      | mJ               |
| Avalanche Current (note1)                        | $I_{AS}$       | 40       | A                |
| Repetitive Avalanche Energy (note1)              | $E_{AR}$       | 391.8    | mJ               |
| Power Dissipation ( $T_C = 25^\circ\text{C}$ )   | $P_D$          | 358      | W                |
| Operating Junction and Storage Temperature Range | $T_J, T_{stg}$ | -55~+150 | $^\circ\text{C}$ |

### Thermal Resistance

| Parameter                               | Symbol     | Value | Unit               |
|-----------------------------------------|------------|-------|--------------------|
| Thermal Resistance, Junction-to-Case    | $R_{thJC}$ | 0.65  | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{thJA}$ | 62    |                    |

**Specifications**  $T_J = 25^{\circ}\text{C}$ , unless otherwise noted

| Parameter                               | Symbol        | Test Conditions                                              | Value |       |           | Unit     |
|-----------------------------------------|---------------|--------------------------------------------------------------|-------|-------|-----------|----------|
|                                         |               |                                                              | Min.  | Typ.  | Max.      |          |
| Static                                  |               |                                                              |       |       |           |          |
| Drain-Source Breakdown Voltage          | $V_{(BR)DSS}$ | $V_{GS} = 0V, I_D = 250\mu A$                                | 60    | --    | --        | V        |
| Zero Gate Voltage Drain Current         | $I_{DSS}$     | $V_{DS} = 60V, V_{GS} = 0V, T_J = 25^{\circ}C$               | --    | --    | 1         | $\mu A$  |
| Gate-Source Leakage                     | $I_{GSS}$     | $V_{GS} = \pm 20V, V_{DS} = 0V$                              | --    | --    | $\pm 100$ | nA       |
| Gate-Source Threshold Voltage           | $V_{GS(th)}$  | $V_{DS} = V_{GS}, I_D = 250\mu A$                            | 2.0   | --    | 4.0       | V        |
| Drain-Source On-Resistance (Note3)      | $R_{DS(on)}$  | $V_{GS} = 10V, I_D = 60A$                                    | --    | 0.005 | 0.006     | $\Omega$ |
| Forward Transconductance                | gfs           | $V_{DS} = 25V, I_D = 60A$                                    | --    | 17    | --        | S        |
| Dynamic                                 |               |                                                              |       |       |           |          |
| Input Capacitance                       | $C_{iss}$     | $V_{GS} = 0V,$<br>$V_{DS} = 25V,$<br>$f = 1.0MHz$            | --    | 2699  | --        | pF       |
| Output Capacitance                      | $C_{oss}$     |                                                              | --    | 1016  | --        |          |
| Reverse Transfer Capacitance            | $C_{rss}$     |                                                              | --    | 487   | --        |          |
| Total Gate Charge                       | $Q_g$         | $V_{DS}=28V, V_{GS} = 15V,$<br>$I_D=42A$                     | --    | 115   | --        | nC       |
| Gate-Source Charge                      | $Q_{gs}$      |                                                              | --    | 13    | --        |          |
| Gate-Drain Charge                       | $Q_{gd}$      |                                                              | --    | 55    | --        |          |
| Turn-on Delay Time                      | $t_{d(on)}$   | $V_{DD} = 28V, I_D = 42A,$<br>$V_{GS} = 15V, R_G = 25\Omega$ | --    | 52    | --        | ns       |
| Turn-on Rise Time                       | $t_r$         |                                                              | --    | 142   | --        |          |
| Turn-off Delay Time                     | $t_{d(off)}$  |                                                              | --    | 355   | --        |          |
| Turn-off Fall Time                      | $t_f$         |                                                              | --    | 230   | --        |          |
| Drain-Source Body Diode Characteristics |               |                                                              |       |       |           |          |
| Continuous Source Current               | $I_{SD}$      | $T_J = 25^{\circ}C, I_{SD} = 60A, V_{GS} = 0V$               | --    | --    | 110       | A        |
| Pulsed Source Current                   | $I_{SM}$      |                                                              | --    | --    | 440       |          |
| Body Forward Voltage                    | $V_{SD}$      | $I_S = 40A, V_{GS} = 0V$                                     | --    | --    | 1.2       | V        |
| Reverse Recovery Time                   | $t_{rr}$      | $V_{GS} = 0V, I_F = 180A,$<br>$di_F/dt = 100A/\mu s$         | --    | 100   | --        | ns       |
| Reverse Recovery Charge                 | $Q_{rr}$      |                                                              | --    | 0.33  | --        | $\mu C$  |

**Notes**

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $L=1\text{mH}, V_{DD} = 50V, R_G = 25\Omega$ , Starting  $T_J = 25^{\circ}\text{C}$
3. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty Cycle  $\leq 1\%$

Typical Characteristics  $T_J = 25^\circ\text{C}$ , unless otherwise noted

Figure 1. Output Characteristics ( $T_J = 25^\circ\text{C}$ )



Figure 2. Body Diode Forward Voltage

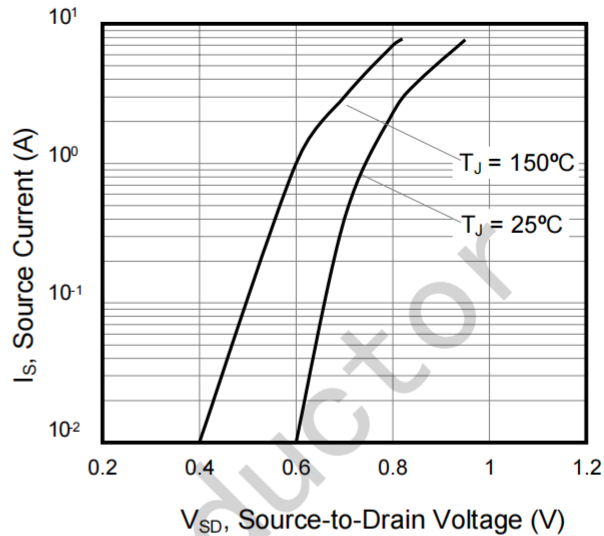


Figure 3. Drain Current vs. Temperature



Figure 4.  $BV_{DSS}$  Variation vs. Temperature

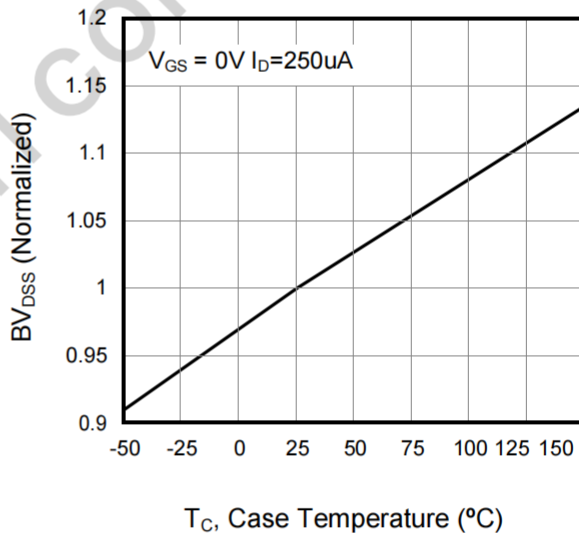
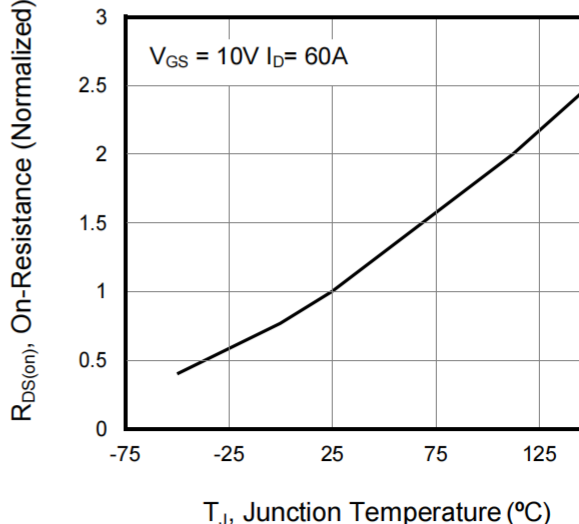


Figure 5. Transfer Characteristics



Figure 6. On-Resistance vs. Temperature



Typical Characteristics  $T_J = 25^\circ\text{C}$ , unless otherwise noted

Figure 7. Capacitance



Figure 8. Gate Charge



Figure 9. Transient Thermal Impedance  
TO-220

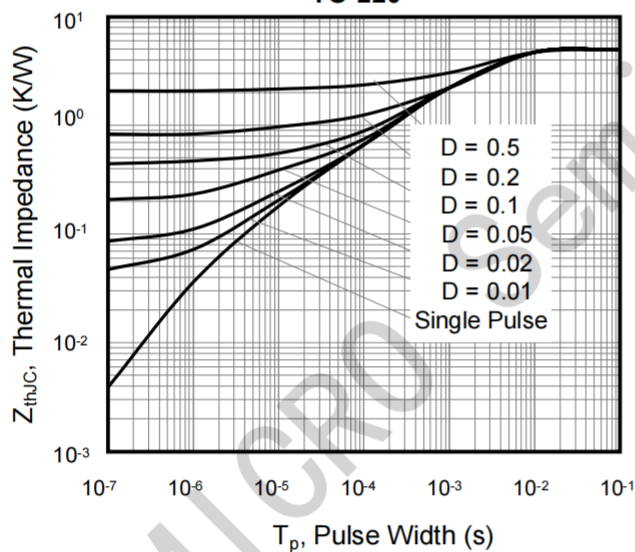


Figure A: Gate Charge Test Circuit and Waveform



Figure B: Resistive Switching Test Circuit and Waveform



Figure C: Unclamped Inductive Switching Test Circuit and Waveform



## Package Information

TO-220



Unit: mm

| Symbol | Size       |       | Symbol | Size  |       | Symbol | Size |      | Symbol | Size |      |
|--------|------------|-------|--------|-------|-------|--------|------|------|--------|------|------|
|        | Min        | Max   |        | Min   | Max   |        | Min  | Max  |        | Min  | Max  |
| W      | 9.66       | 10.28 | W5     | 9.80  | 10.20 | L4**   | 6.20 | 6.60 | T3     | 0.45 | 0.60 |
| W1     | 2.54 (TYP) |       | L      | 9.00  | 9.40  | L5     | 2.79 | 3.30 | G(Φ)   | 3.50 | 3.70 |
| W2     | 0.70       | 0.95  | L1     | 6.40  | 6.80  | T      | 4.30 | 4.70 |        |      |      |
| W3     | 1.17       | 1.37  | L2     | 2.70  | 2.90  | T1     | 1.15 | 1.40 |        |      |      |
| W4*    | 1.32       | 1.72  | L3     | 12.70 | 14.27 | T2     | 2.20 | 2.60 |        |      |      |