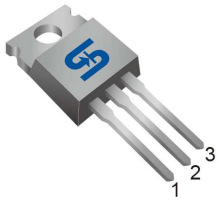
TAIWAN SEMICONDUCTOR

RoHS COMPLIANCE

# TSM100N06

60V N-Channel Power MOSFET

**TO-220**




**Pin Definition:**
1. Gate
2. Drain
3. Source

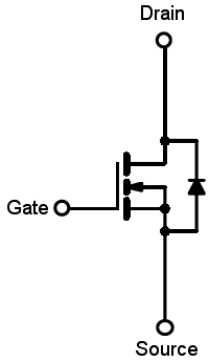
## PRODUCT SUMMARY

| $V_{DS}$ (V) | $R_{DS(on)}$(mΩ) | $I_D$ (A) |
|---|---|---|
| 60 | 6.7 @ $V_{GS}$ =10V | 100 |

## Features

- Advanced Trench Technology
- Low $R_{DS(ON)}$ 6.7mΩ (Max.)
- Low gate charge typical @ 81nC (Typ.)
- Low Crss typical @ 339pF (Typ.)

## Block Diagram




N-Channel MOSFET

## Ordering Information

| Part No. | Package | Packing |
|---|---|---|
| TSM100N06CZ C0G | TO-220 | 50pcs / Tube |

Note: "G" denote for Halogen Free Product

## Absolute Maximum Rating (Ta = 25°C unless otherwise noted)

| Parameter | | Symbol | Limit | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 60 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current | $T_C$=25°C | $I_D$ | 100(3) | A |
| | $T_C$=70°C | | 80 | |
| | $T_A$=25°C | | 14 | |
| | $T_A$=70°C | | 11 | |
| Drain Current-Pulsed Note 1 | | $I_{DM}$ | 400 | A |
| Avalanche Current, L=0.1mH | | $I_{AS}$ | 71 | A |
| Avalanche Energy, L=0.1mH | | $E_{AS}$, $E_{AR}$ | 400 | mJ |
| Maximum Power Dissipation | $T_C$=25°C | $P_D$ | 167 | W |
| | $T_C$=70°C | | 107 | |
| | $T_A$=25°C | | 2 | |
| | $T_A$=70°C | | 1.3 | |
| Storage Temperature Range | | $T_{STG}$ | -55 to +150 | °C |
| Operating Junction Temperature Range | | $T_J$ | -55 to +150 | °C |

* Limited by maximum junction temperature

## Thermal Performance

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Thermal Resistance - Junction to Case | $R\Theta_{JC}$ | 0.8 | °C/W |
| Thermal Resistance - Junction to Ambient | $R\Theta_{JA}$ | 62.5 | °C/W |

Notes: Surface mounted on FR4 board t ≤ 10sec

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60V N-Channel Power MOSFET

## Electrical Specifications (Ta = 25°C unless otherwise noted)

| Parameter | Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Static** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{GS}$ = 0V, $I_D$ = 250uA | $BV_{DSS}$ | 60 | -- | -- | V |
| Drain-Source On-State Resistance | $V_{GS}$ = 10V, $I_D$ = 30A | $R_{DS(ON)}$ | -- | 5.7 | 6.7 | mΩ |
| Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250uA | $V_{GS(TH)}$ | 2 | 3 | 4 | V |
| Zero Gate Voltage Drain Current | $V_{DS}$ = 48V, $V_{GS}$ = 0V | $I_{DSS}$ | -- | -- | 1 | uA |
| Gate Body Leakage | $V_{GS}$ = ±20V, $V_{DS}$ = 0V | $I_{GSS}$ | -- | -- | ±100 | nA |
| **Dynamic** | | | | | | |
| Total Gate Charge | $V_{DS}$ = 30V, $I_D$ = 30A, $V_{GS}$ = 10V | $Q_g$ | -- | 81 | -- | nC |
| Gate-Source Charge | | $Q_{gs}$ | -- | 23 | -- | |
| Gate-Drain Charge | | $Q_{gd}$ | -- | 24 | -- | |
| Input Capacitance | $V_{DS}$ = 30V, $V_{GS}$ = 0V, f = 1.0MHz | $C_{iss}$ | -- | 4382 | -- | pF |
| Output Capacitance | | $C_{oss}$ | -- | 668 | -- | |
| Reverse Transfer Capacitance | | $C_{rss}$ | -- | 339 | -- | |
| **Switching** | | | | | | |
| Turn-On Delay Time | $V_{GS}$ = 10V, $V_{DS}$ = 30V, $R_G$ = 3.3Ω | $t_{d(on)}$ | -- | 25 | -- | nS |
| Turn-On Rise Time | | $t_r$ | -- | 19 | -- | |
| Turn-Off Delay Time | | $t_{d(off)}$ | -- | 85 | -- | |
| Turn-Off Fall Time | | $t_f$ | -- | 43 | -- | |
| **Drain-Source Diode Characteristics and Maximum Rating** | | | | | | |
| Drain-Source Diode Forward Voltage | $V_{GS}$=0V, $I_S$=20A | $V_{SD}$ | - | 0.8 | 1.3 | V |
| Reverse Recovery Time | $I_S$ = 30A, $T_J$=25 °C dI/dt = 100A/us | $t_{fr}$ | | 36 | | nS |
| Reverse Recovery Charge | | $Q_{fr}$ | | 53 | | nC |

Notes:

1. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
2. $R_{\Theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\Theta JC}$ is guaranteed by design while $R_{\Theta CA}$ is determined by the user's board design. $R_{\Theta JA}$ shown below for single device operation on FR-4 in still air
3. Calculated continuous current based on maximum allowable junction temperature, Package limitation current is 75A

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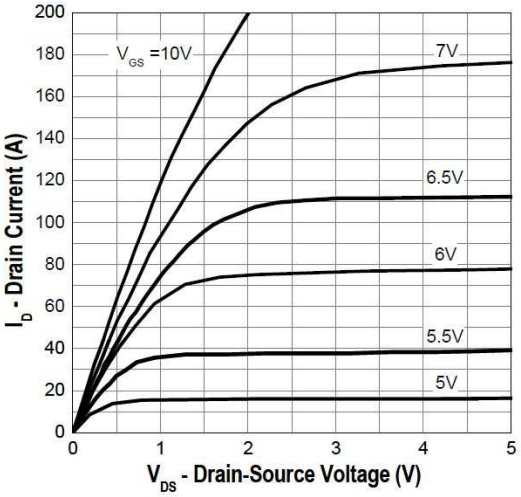
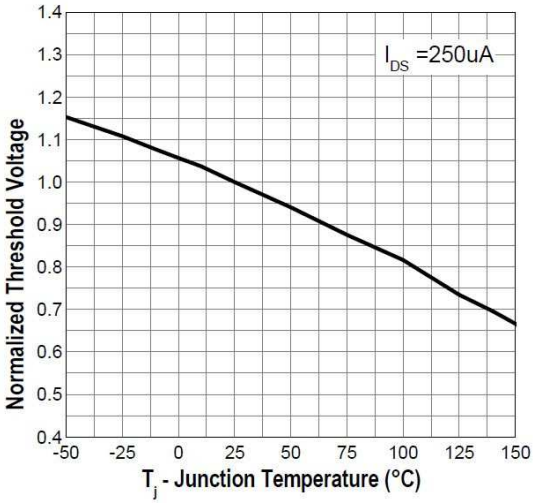
## Electrical Characteristics Curve (Ta = 25°C, unless otherwise noted)

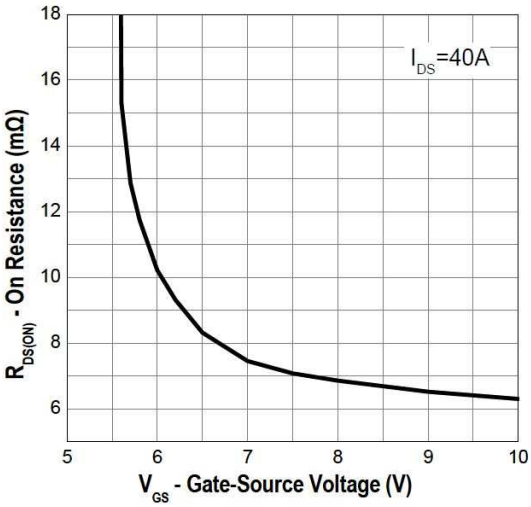
### Output Characteristics



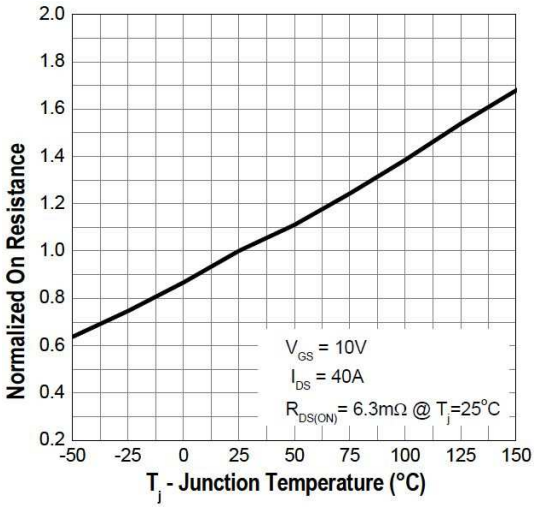

### Gate Threshold Voltage



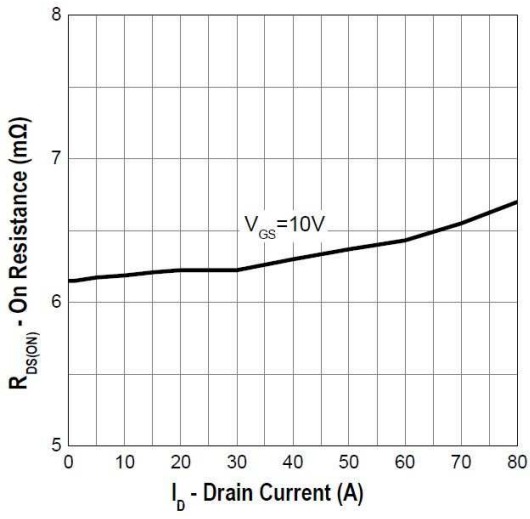

### Gate Source On Resistance



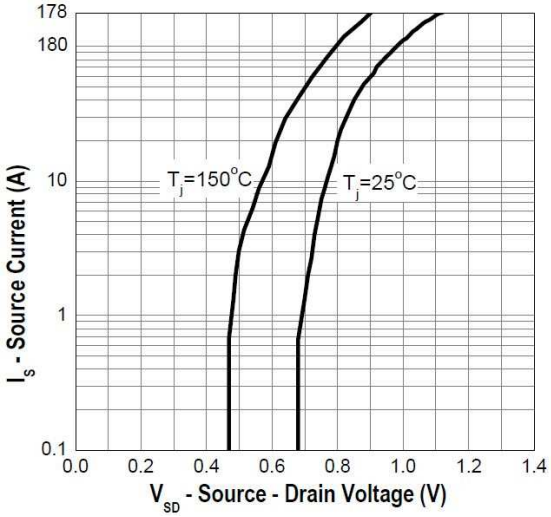

### Drain-Source On Resistance




### Drain-Source On-Resistance

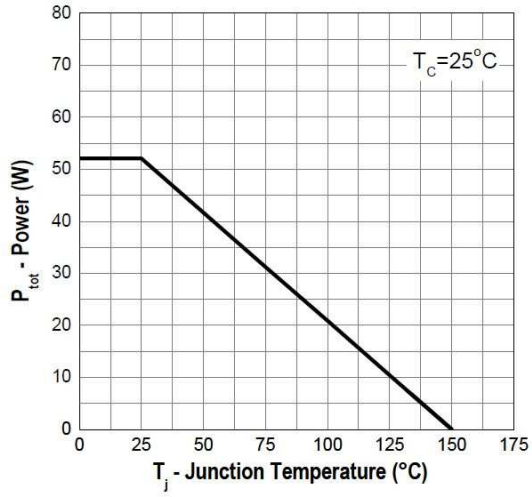



### Source-Drain Diode Forward Voltage

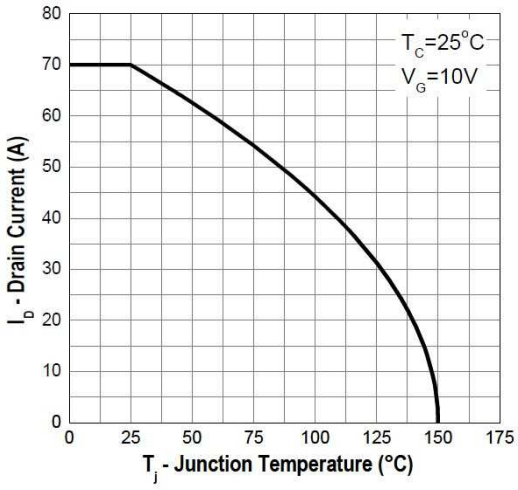


## Electrical Characteristics Curve (Ta = 25°C, unless otherwise noted)

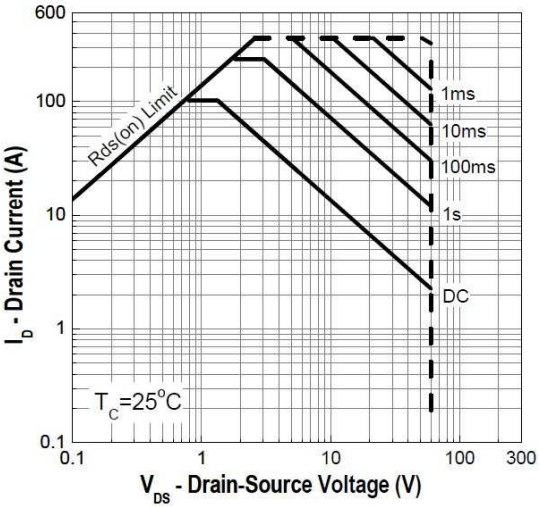
### Power Derating



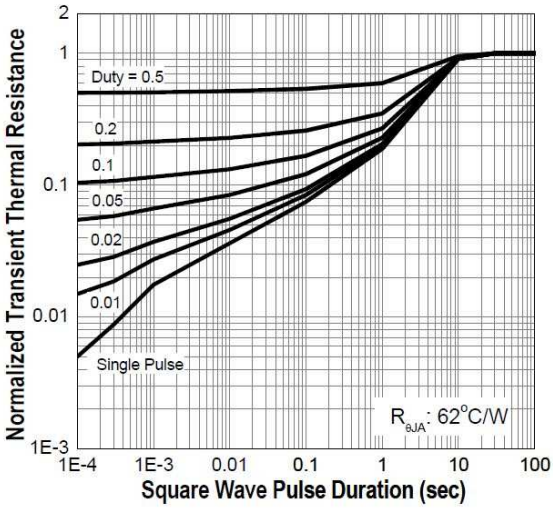

### Drain Current vs. Junction Temperature



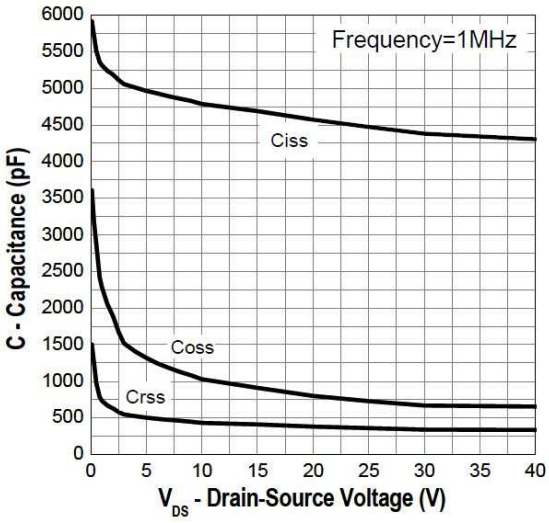

### Safe Operation Area



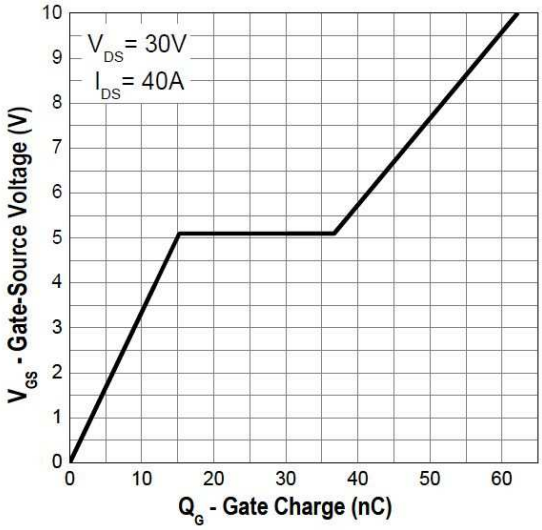

### Transient Thermal Impedance



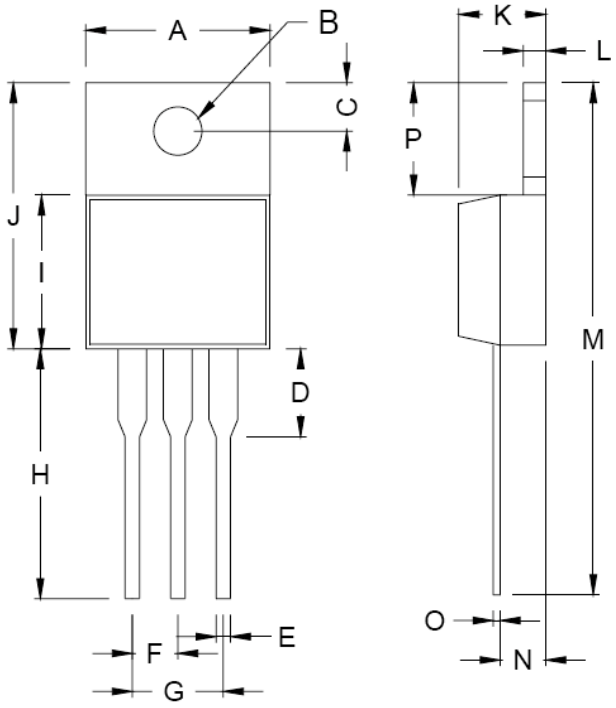

### Capacitance




### Gate Charge



## TO-220 Mechanical Drawing




| TO-220 DIMENSION | | | | |
|---|---|---|---|---|
| DIM | MILLIMETERS | | INCHES | |
| | MIN | MAX | MIN | MAX |
| A | 10.000 | 10.500 | 0.394 | 0.413 |
| B | 3.740 | 3.910 | 0.147 | 0.154 |
| C | 2.440 | 2.940 | 0.096 | 0.116 |
| D | - | 6.350 | - | 0.250 |
| E | 0.381 | 1.106 | 0.015 | 0.040 |
| F | 2.345 | 2.715 | 0.092 | 0.058 |
| G | 4.690 | 5.430 | 0.092 | 0.107 |
| H | 12.700 | 14.732 | 0.500 | 0.581 |
| J | 14.224 | 16.510 | 0.560 | 0.650 |
| K | 3.556 | 4.826 | 0.140 | 0.190 |
| L | 0.508 | 1.397 | 0.020 | 0.055 |
| M | 27.700 | 29.620 | 1.060 | 1.230 |
| N | 2.032 | 2.921 | 0.080 | 0.115 |
| O | 0.255 | 0.610 | 0.010 | 0.024 |
| P | 5.842 | 6.858 | 0.230 | 0.270 |

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