TAIWAN SEMICONDUCTOR

RoHS COMPLIANCE

# TSM2N7002K

60V N-Channel MOSFET

**SOT-23**


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

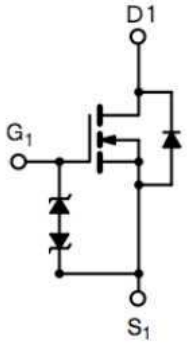
**PRODUCT SUMMARY**

| $V_{DS}$ (V) | $R_{DS(on)}$ (max) | $I_D$ (mA) |
|---|---|---|
| 60 | 2 @ $V_{GS}$ = 10V | 300 |
| | 4 @ $V_{GS}$ = 4.5V | 200 |

## Features

- Low On-Resistance
- ESD Protected 2KV
- High Speed Switching
- Low Voltage Drive

## Block Diagram




N-Channel MOSFET

## Ordering Information

| Part No. | Package | Packing |
|---|---|---|
| TSM2N7002KCX RFG | SOT-23 | 3kpcs / 7" Reel |

**Note:** "G" denotes for Halogen Free

## Absolute Maximum Ratings ($T_A$=25°C unless otherwise noted)

| Parameter | | Symbol | Limit | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 60 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | V |
| Drain Current | Continuous @ $T_A$=25°C | $I_D$ | 300 | mA |
| | Pulsed | $I_{DM}$ | 800 | |
| Drain Reverse Current | Continuous @ $T_A$=25°C | $I_{DR}$ | 300 | mA |
| | Pulsed | $I_{DMR}$ | 800 | |
| Maximum Power Dissipation | | $P_D$ | 300 | mW |
| Operating Junction Temperature | | $T_J$ | +150 | °C |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

## Thermal Performance

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Lead Temperature (1/8" from case) | $T_L$ | 5 | S |
| Junction to Ambient Thermal Resistance (PCB mounted) | $R_{\Theta JA}$ | 350 | °C/W |

**Notes:**

a. Pulse width ≤300μs, Duty cycle ≤2%

b. When the device is mounted on a glass epoxy board with area measuring 1 x 0.75 x 0.62 inch.

c. The power dissipation of the package may result in a continuous drain current.

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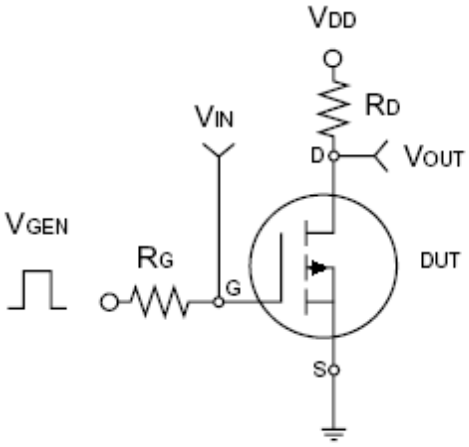
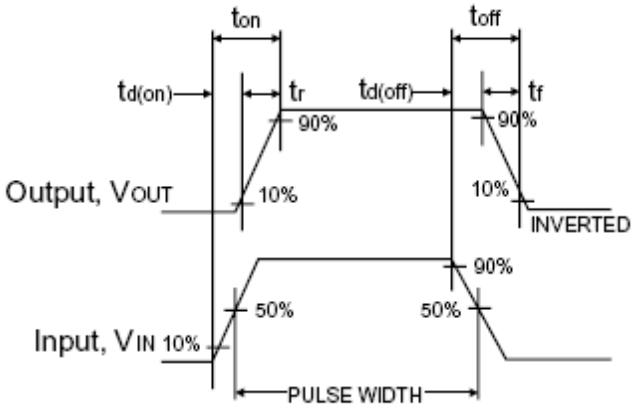
## Electrical Specifications ($T_A$=25°C, unless otherwise noted)

| Parameter | Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Static** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{GS}$ =0V, $I_D$ =250μA | $BV_{DSS}$ | 60 | -- | -- | V |
| Gate Threshold Voltage | $V_{DS}$ =$V_{GS}$, $I_D$ =250μA | $V_{GS(TH)}$ | 1.0 | 1.5 | 2.5 | V |
| Gate Body Leakage | $V_{GS}$ =±20V, $V_{DS}$ =0V | $I_{GSS}$ | -- | -- | ±10 | μA |
| Zero Gate Voltage Drain Current | $V_{DS}$ =60V, $V_{GS}$ =0V | $I_{DSS}$ | -- | -- | 1.0 | μA |
| Drain-Source On-State Resistance | $V_{GS}$ =10V, $I_D$ =300mA | $R_{DS(ON)}$ | -- | 1.2 | 2 | Ω |
| | $V_{GS}$ =4.5V, $I_D$ =200mA | | -- | 2 | 4 | |
| Forward Transconductance | $V_{DS}$ =10V, $I_D$ =200mA | $g_{fs}$ | 100 | -- | -- | mS |
| Diode Forward Voltage | $I_S$ =300mA, $V_{GS}$ =0V | $V_{SD}$ | -- | 0.8 | 1.4 | V |
| **Dynamic**[b] | | | | | | |
| Total Gate Charge | $V_{DS}$ =10V, $I_D$ = 250mA, $V_{GS}$ =4.5V | $Q_g$ | -- | 0.4 | 0.6 | nC |
| Input Capacitance | $V_{DS}$ = 25V, $V_{GS}$ = 0V, f = 1.0MHz | $C_{iss}$ | -- | 30 | -- | pF |
| Output Capacitance | | $C_{oss}$ | -- | 6 | -- | |
| Reverse Transfer Capacitance | | $C_{rss}$ | -- | 2.5 | -- | |
| **Switching**[c] | | | | | | |
| Turn-On Delay Time | $V_{DD}$ =30V, $R_G$ =10Ω $I_D$ =200mA, $V_{GEN}$ =10V, | $t_{d(on)}$ | -- | -- | 25 | ns |
| Turn-Off Delay Time | | $t_{d(off)}$ | -- | -- | 35 | |

**Notes:**
a. pulse test: PW ≤300μs, duty cycle ≤2%
b. For DESIGN AID ONLY, not subject to production testing.
c. Switching time is essentially independent of operating temperature.



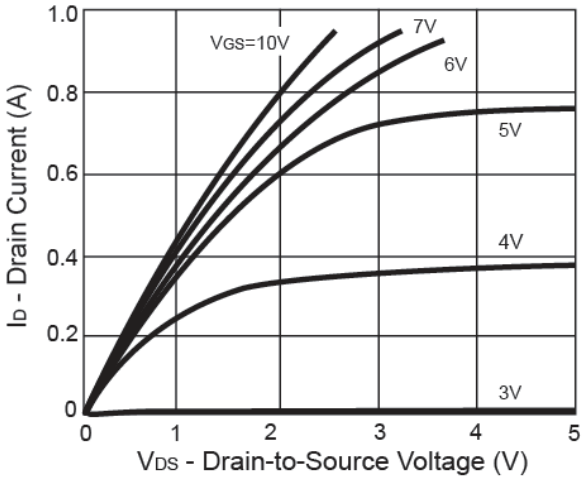

Switching Test Circuit



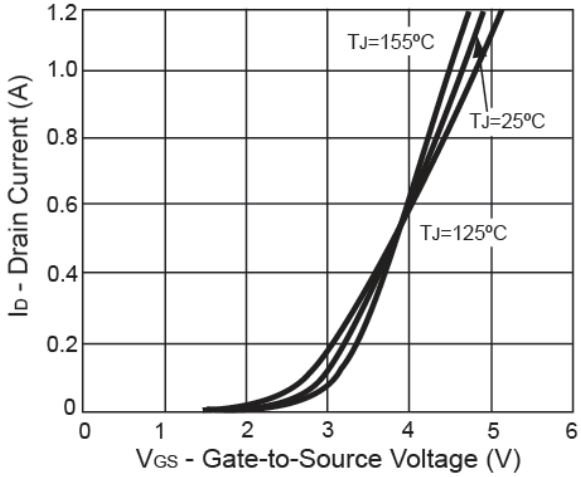

Switchin Waveforms

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

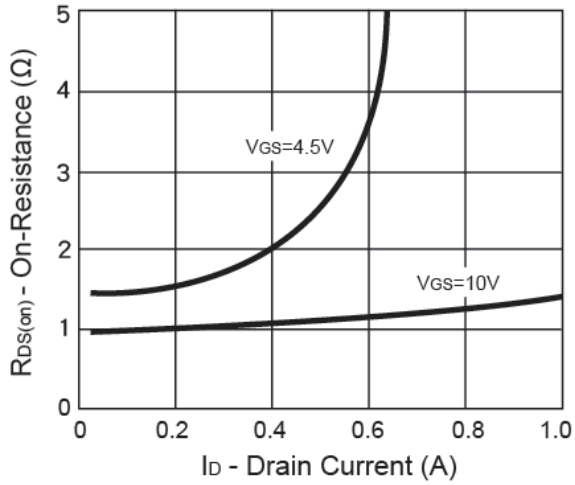
### Output Characteristics



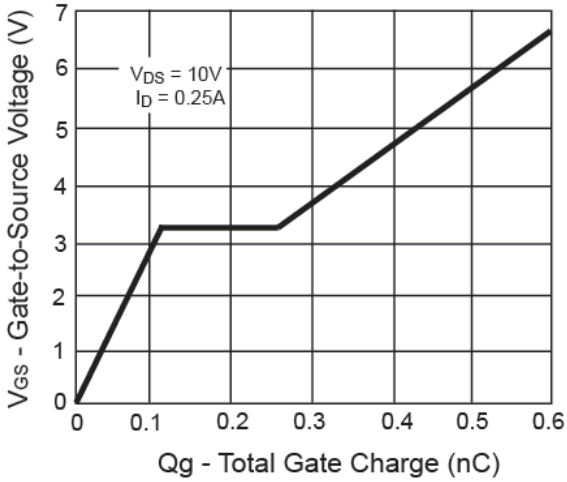

### Transfer Characteristics



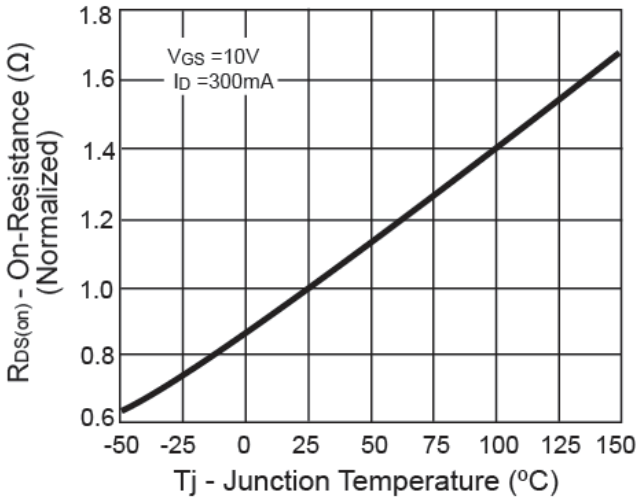

### On-Resistance vs. Drain Current



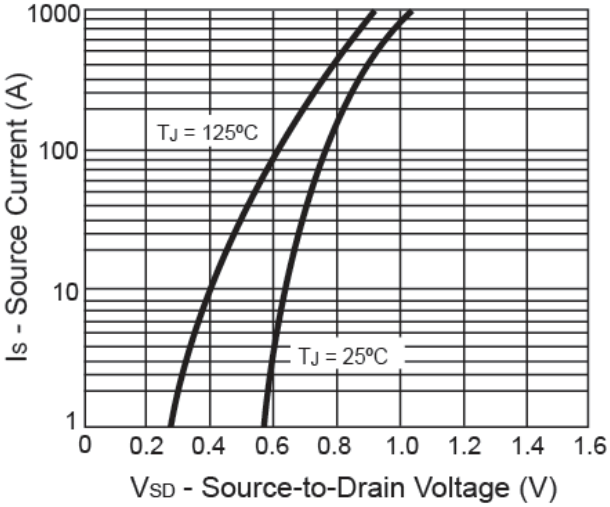

### Gate Charge




### On-Resistance vs. Junction Temperature

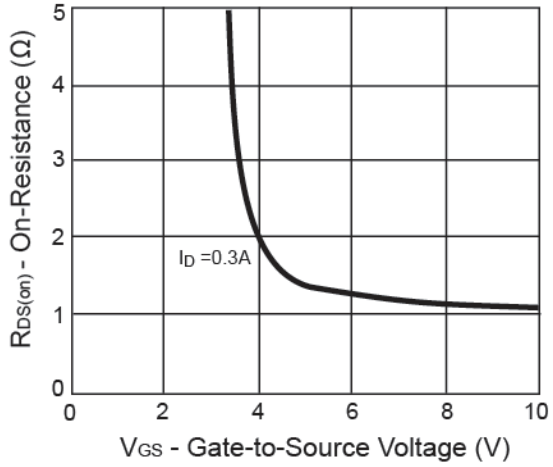



### Source-Drain Diode Forward Voltage

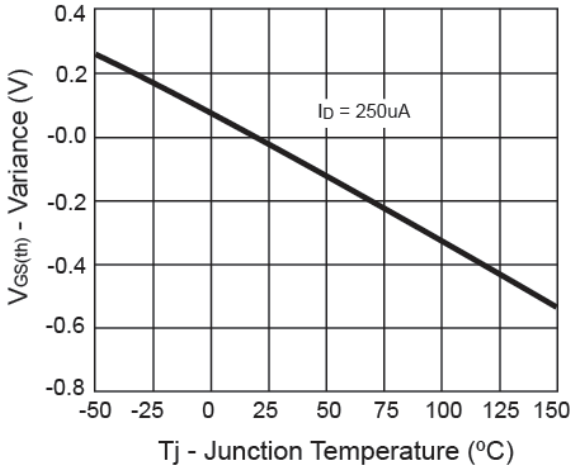


## Electrical Characteristics Curve (Ta = 25°C, unless otherwise noted)

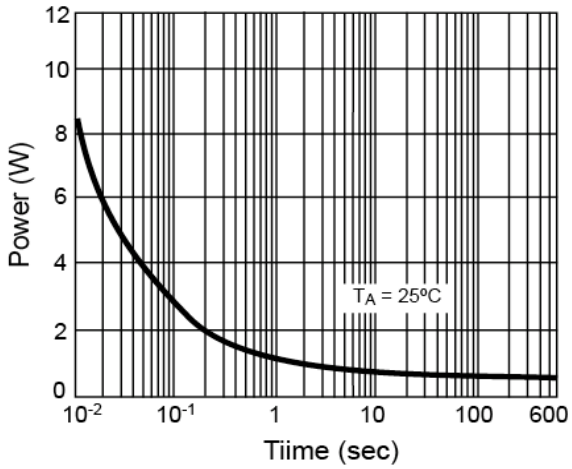
### On-Resistance vs. Gate-Source Voltage



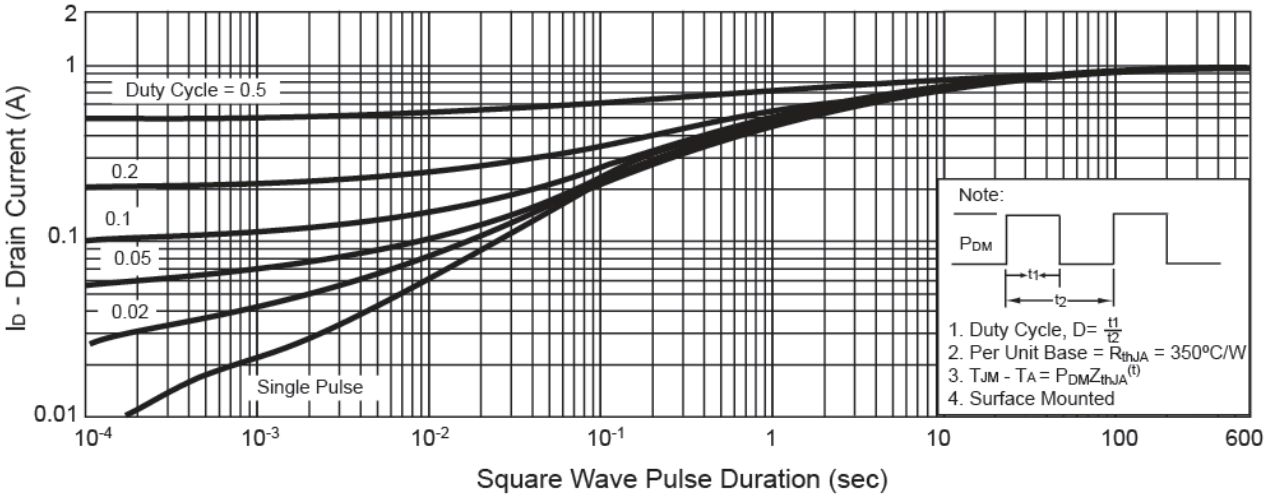

### Threshold Voltage




### Single Pulse Power




### Normalized Thermal Transient Impedance, Junction-to-Ambient



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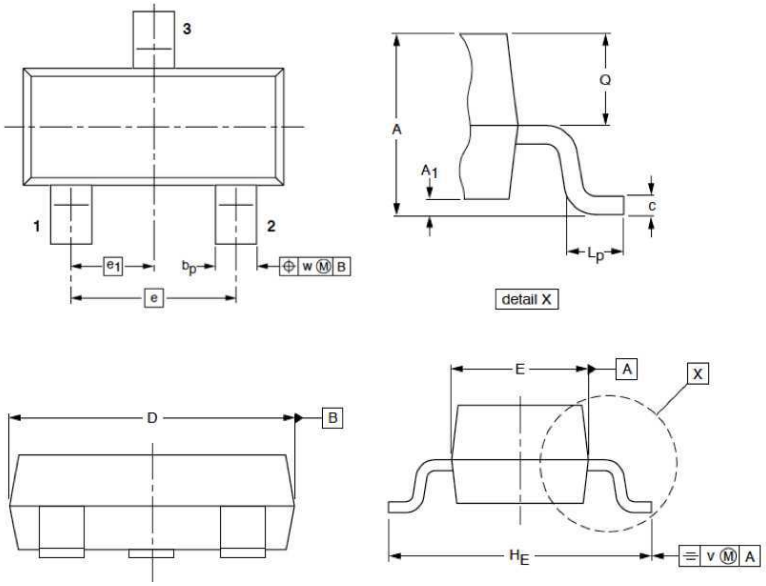
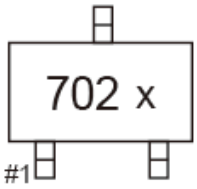
## SOT-23 Mechanical Drawing




| SOT-23 DIMENSION | | | | |
|---|---|---|---|---|
| DIM | MILLIMETERS | | INCHES | |
| | MIN | MAX | MIN | MAX. |
| A | 1.00 BSC | | 0.039 BSC | |
| A1 | -- | 0.10 | -- | 0.004 |
| bp | 0.37 | 0.42 | 0.014 | 0.016 |
| C | 0.09 | 0.15 | 0.004 | 0.005 |
| D | 2.80 | 3.00 | 0.110 | 0.118 |
| E | 1.20 | 1.40 | 0.047 | 0.055 |
| e | 1.9 BSC | | 0.075 BSC | |
| e1 | 0.95 BSC | | 0.037 BSC | |
| $H_E$ | 2.35 | 2.45 | 0.093 | 0.096 |
| $L_P$ | 0.15 | 0.45 | 0.005 | 0.018 |
| Q | 0.45 | 0.55 | 0.018 | 0.022 |
| V | 0.2 BSC | | 0.007 BSC | |
| W | 0.1 BSC | | 0.004 BSC | |

## Marking Diagram




**702** = TSM2N7002KCX Device Code
**x** = Internal Code

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