

## FEATURES

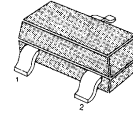
- ❑ Lower  $R_{DS(on)}$
- ❑ Improved Inductive Ruggedness
- ❑ Fast Switching Times
- ❑ Lower Input Capacitance
- ❑ Extended Safe Operating Area
- ❑ Improved High Temperature Reliability

$$BV_{DSS} = 60 \text{ V}$$

$$R_{DS(on)} = 5.0 \Omega$$

$$I_D = 200 \text{ mA}$$

## SOT-23



1.Gate 2. Source 3. Drain

## Product Summary

| Part Number | $BV_{DSS}$ | $R_{DS(on)}$ | $I_D$ |
|-------------|------------|--------------|-------|
| 2N7002      | 60V        | $5.0\Omega$  | 115mA |

## Absolute Maximum Ratings

| Symbol         | Characteristic                                       | Value        | Units                |
|----------------|------------------------------------------------------|--------------|----------------------|
| $V_{DSS}$      | Drain-to-Source Voltage                              | 60           | V                    |
| $I_D$          | Continuous Drain Current ( $T_C=25^\circ\text{C}$ )  | 115          | mA                   |
|                | Continuous Drain Current ( $T_C=100^\circ\text{C}$ ) | 73           |                      |
| $I_{DM}$       | Drain Current-Pulsed <sup>①</sup>                    | 800          | mA                   |
| $V_{GS}$       | Gate-to-Source Voltage                               | $\pm 20$     | V                    |
| $P_D$          | Total Power Dissipation ( $T_C=25^\circ\text{C}$ )   | 0.2          | W                    |
|                | Linear Derating Factor                               | 1.6          | mW/ $^\circ\text{C}$ |
| $T_J, T_{STG}$ | Operating Junction and Storage Temperature Range     | - 55 to +150 | $^\circ\text{C}$     |

## Thermal Resistance

| Symbol          | Characteristic      | Typ. | Max. | Units              |
|-----------------|---------------------|------|------|--------------------|
| $R_{\theta JA}$ | Junction-to-Ambient | --   | 625  | $^\circ\text{C/W}$ |

# 2N7002MTF

## N-Channel Small Signal MOSFET

### Electrical Characteristics (T<sub>C</sub>=25 °C unless otherwise specified)

| Symbol              | Characteristic                               | Min. | Typ. | Max. | Units | Test Condition                                                              |
|---------------------|----------------------------------------------|------|------|------|-------|-----------------------------------------------------------------------------|
| BV <sub>DSS</sub>   | Drain-Source Breakdown Voltage               | 60   | -    | -    | V     | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                                |
| V <sub>GS(th)</sub> | Gate Threshold Voltage                       | 1.2  | -    | 2.5  | V     | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                  |
| I <sub>GSS</sub>    | Gate-Source Leakage, Forward                 | -    | -    | 100  | nA    | V <sub>GS</sub> = 20V                                                       |
|                     | Gate-Source Leakage, Reverse                 | -    | -    | -100 |       | V <sub>GS</sub> = -20V                                                      |
| I <sub>DSS</sub>    | Drain-to-Source Leakage Current              | -    | -    | 1.0  | μA    | V <sub>GS</sub> = 40V                                                       |
|                     |                                              | -    | -    | 500  |       | V <sub>GS</sub> = 40V, T <sub>C</sub> = 125 °C                              |
| I <sub>D(ON)</sub>  | On-State Drain-Source Current                | 0.5  | -    | -    | A     | V <sub>DS</sub> = 10V, V <sub>GS</sub> = 10V                                |
| R <sub>DS(on)</sub> | Static Drain-Source<br>On-State Resistance ② | -    | -    | 5.0  | Ω     | V <sub>GS</sub> = 10V, I <sub>D</sub> = 0.5A                                |
| g <sub>fs</sub>     | Forward Transconductance ②                   | 0.08 | -    | -    | S     | V <sub>DS</sub> = 15V, I <sub>D</sub> = 0.2A                                |
| C <sub>iss</sub>    | Input Capacitance                            | -    | -    | 50   | pF    | V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                  |
| C <sub>oss</sub>    | Output Capacitance                           | -    | -    | 25   |       |                                                                             |
| C <sub>rss</sub>    | Reverse Transfer Capacitance                 | -    | -    | 5    |       |                                                                             |
| t <sub>d(on)</sub>  | Turn-On Delay Time                           | -    | -    | 20   | ns    | V <sub>DD</sub> = 30V, I <sub>D</sub> = 0.2A<br>R <sub>G</sub> = 25Ω<br>② ③ |
| t <sub>r</sub>      | Rise Time                                    | -    | -    | -    |       |                                                                             |
| t <sub>d(off)</sub> | Turn-Off Delay Time                          | -    | -    | 20   |       |                                                                             |
| t <sub>f</sub>      | Fall Time                                    | -    | -    | -    |       |                                                                             |

### Source-Drain Diode Ratings and Characteristics

| Symbol          | Characteristic            | Min. | Typ. | Max. | Units | Test Condition                                                         |
|-----------------|---------------------------|------|------|------|-------|------------------------------------------------------------------------|
| I <sub>S</sub>  | Continuous Source Current | -    | -    | 115  | mA    | Integral reverse pn-diode<br>in the MOSFET                             |
| I <sub>SD</sub> | Pulse Source Current ①    | -    | -    | 800  | mA    |                                                                        |
| V <sub>SD</sub> | Diode Forward Voltage ②   | -    | -    | 1.5  | V     | T <sub>A</sub> = 25 °C, I <sub>S</sub> = 115mA<br>V <sub>GS</sub> = 0V |

#### Notes ;

- ① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
- ② Pulse Test : Pulse Width = 250μs, Duty Cycle ≤ 2%
- ③ Essentially Independent of Operating Temperature

Fig 1. Output Characteristics

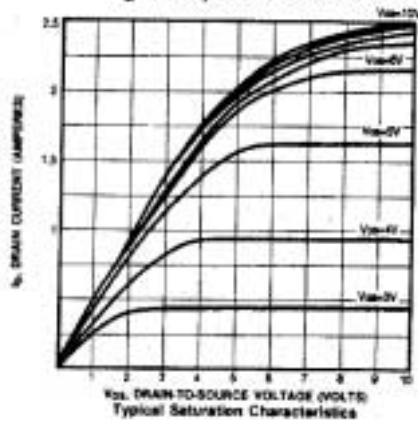


Fig 2. Transfer Characteristics

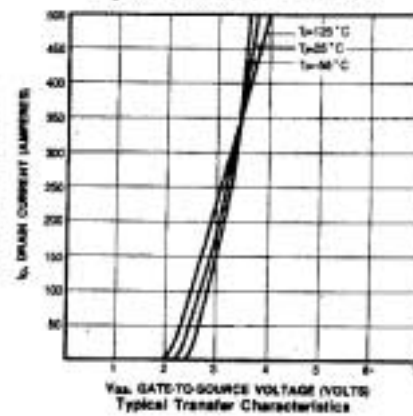


Fig 3. On-Resistance vs. Drain Current

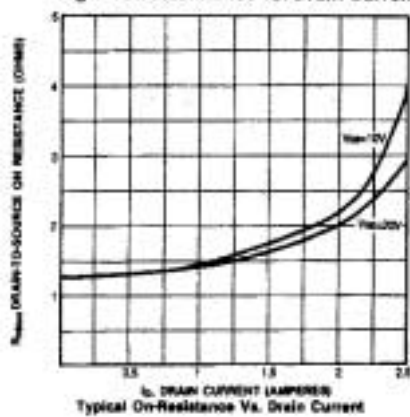


Fig 4. Source-Drain Diode Forward Voltage

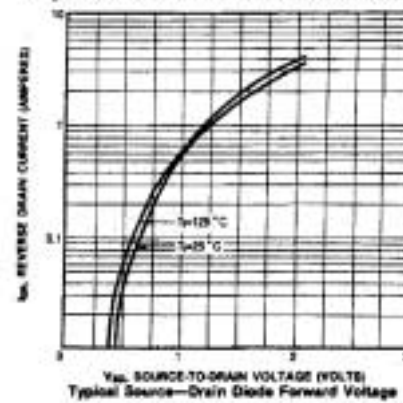


Fig 5. Capacitance vs. Drain-Source Voltage

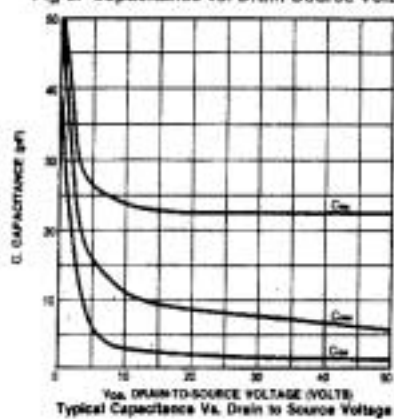
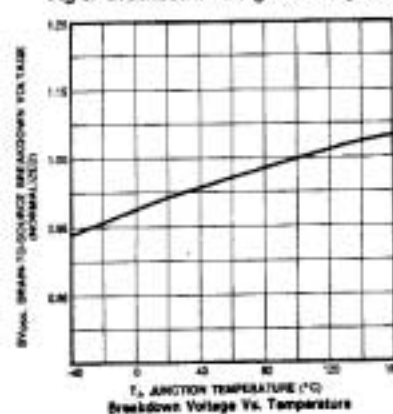
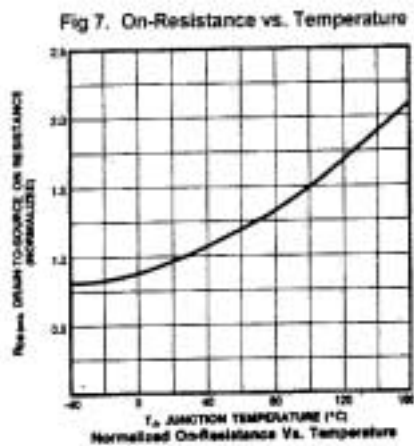


Fig 6. Breakdown Voltage vs. Temperature





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