



**THE DATASHEET OF**  
**2N7002**

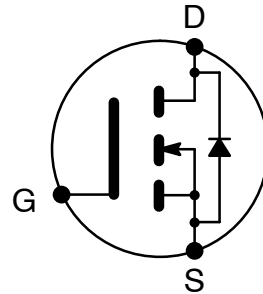




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## 2N7002

### N-Ch, Enhancement Mode Field Effect Transistor SOT-23 Type Package



**Features:**

- High Density Cell Design for Low  $R_{DS(ON)}$
- Voltage Controlled Small Signal Switch
- Rugged and Reliable
- High Saturation Current Capability

**Absolute Maximum Ratings:** ( $T_A = +25^\circ\text{C}$  unless otherwise specified)

Drain-Source Voltage, $V_{DSS}$ .....	60V
Drain-Gate Voltage ( $R_{GS} \leq 1\text{M}\Omega$ ), $V_{DGR}$ .....	60V
Gate-Source Voltage, $V_{GS}$	
Continuous .....	$\pm 20\text{V}$
Non-Repetitive ( $t_p \leq 50\mu\text{s}$ ) .....	$\pm 40\text{V}$
Maximum Drain Current, $I_D$	
Continuous .....	115mA
Pulsed .....	800mA
Maximum Power Dissipation, $P_D$ .....	200mW
Derate above $25^\circ\text{C}$ .....	1.6mW/ $^\circ\text{C}$
Operating Junction Temperature Range, $T_J$ .....	$-55^\circ$ to $+150^\circ\text{C}$
Storage Temperature Range, $T_{stg}$ .....	$-55^\circ$ to $+150^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient, $R_{th(JA)}$ .....	625 $^\circ\text{C}/\text{W}$
Maximum Lead Temperature (During Soldering, 1/16" from Case, 10sec), $T_L$ .....	$+300^\circ\text{C}$

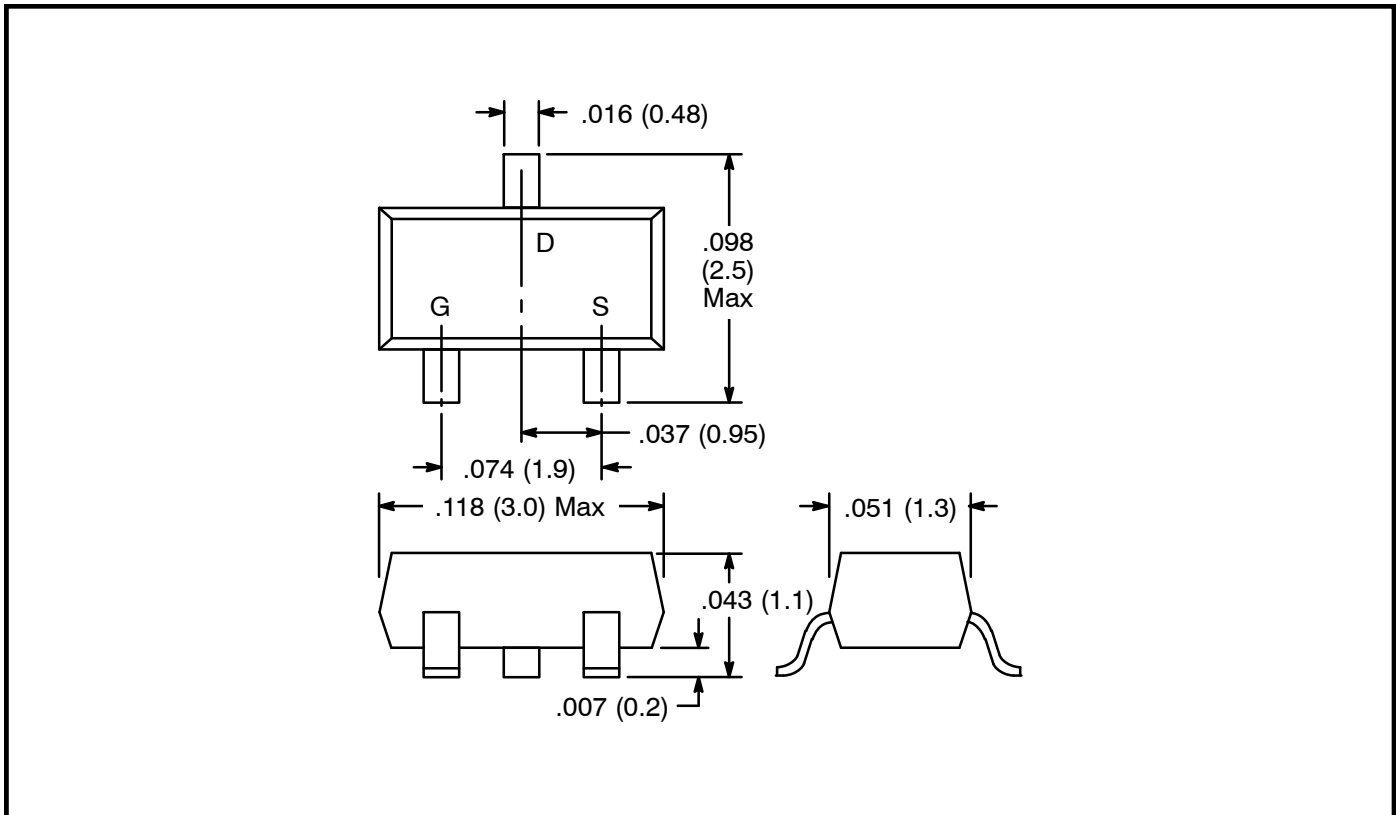
**Electrical Characteristics:** ( $T_A = +25^\circ\text{C}$  unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>OFF Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0\text{V}, I_D = 10\mu\text{A}$	60	-	-	V
Zero-Gate-Voltage Drain Current	$I_{DSS}$	$V_{DS} = 60\text{V}, V_{GS} = 0$		-	1.0	$\mu\text{A}$
			$T_J = +125^\circ\text{C}$	-	0.5	mA
Gate-Body Leakage Current, Forward	$I_{GSSF}$	$V_{GSF} = 20\text{V}, V_{DS} = 0$	-	-	100	nA
Gate-Body Leakage Current, Reverse	$I_{GSSR}$	$V_{GSF} = -20\text{V}, V_{DS} = 0$	-	-	-100	nA

**Electrical Characteristics (Cont'd):** ( $T_A = +25^\circ\text{C}$  unless otherwise specified)


<b>ON Characteristics</b> (Note 1)							
Gate Threshold Voltage	$V_{GS(th)}$	$I_D = 250\mu\text{A}, V_{DS} = V_{GS}$	1.0	2.1	2.5	V	
Static Drain-Source ON Resistance	$r_{DS(on)}$	$V_{GS} = 10\text{V}, I_D = 500\text{mA}$		-	1.2	7.5	$\Omega$
			$T_J = +100^\circ\text{C}$	-	1.7	13.5	$\Omega$
		$V_{GS} = 5\text{V}, I_D = 50\text{mA}$		-	1.7	7.5	$\Omega$
			$T_J = +100^\circ\text{C}$	-	2.4	13.5	$\Omega$
Drain-Source ON-Voltage	$V_{DS(on)}$	$V_{GS} = 10\text{V}, I_D = 500\text{mA}$	-	0.6	3.75	V	
		$V_{GS} = 5\text{V}, I_D = 50\text{mA}$	-	0.09	1.5	V	
ON-State Drain Current	$I_{D(on)}$	$V_{GS} = 10\text{V}, V_{DS} \geq 2 V_{DS(on)}$	500	2700	-	mA	
Forward Transconductance	$g_{FS}$	$V_{DS} \geq 2 V_{DS(on)}, I_D = 200\text{mA}$	80	320	-	mS	
<b>Dynamic Characteristics</b>							
Input Capacitance	$C_{iss}$	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$	-	20	50	pF	
Reverse Transfer Capacitance	$C_{oss}$		-	11	25	pF	
Output Capacitance	$C_{rss}$		-	4	5	pF	
Turn-On Time	$t_{on}$	$V_{DD} = 30\text{V}, R_L = 150\Omega, I_D = 200\text{mA}, V_{GS} = 10\text{V}, R_{GEN} = 25\Omega$	-	-	20	ns	
Turn-Off Time	$t_{off}$		-	-	20	ns	
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>							
Maximum Continuous Drain-Source Diode Forward Current	$I_S$		-	-	115	mA	
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$		-	-	0.8	A	
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS} = 0\text{V}, I_S = 115\text{mA}, \text{Note 1}$	-	0.88	1.5	V	

Note 1. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .



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