

# 2N7002L

勝特力材料 886-3-5753170  
勝特力电子(上海) 86-21-54151736  
勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

## Small Signal MOSFET

### 60 V, 115 mA, N-Channel SOT-23

#### Features

- Pb-Free Packages are Available

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	60	Vdc
Drain-Gate Voltage ( $R_{GS} = 1.0 \text{ M}\Omega$ )	$V_{DGR}$	60	Vdc
Drain Current – Continuous $T_C = 25^\circ\text{C}$ (Note 1) – Pulsed (Note 2)	$I_D$ $I_{DM}$	$\pm 115$ $\pm 75$ $\pm 800$	mAdc
Gate-Source Voltage – Continuous – Non-repetitive ( $t_p \leq 50 \mu\text{s}$ )	$V_{GS}$ $V_{GSM}$	$\pm 20$ $\pm 40$	Vdc Vpk

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board (Note 3) $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	225 1.8	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	556	$^\circ\text{C}/\text{W}$
Total Device Dissipation Alumina Substrate, (Note 4) $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	300 2.4	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	417	$^\circ\text{C}/\text{W}$
Junction and Storage Temperature	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

- The Power Dissipation of the package may result in a lower continuous drain current.
- Pulse Test: Pulse Width  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .
- FR-5 =  $1.0 \times 0.75 \times 0.062$  in.
- Alumina =  $0.4 \times 0.3 \times 0.025$  in 99.5% alumina.

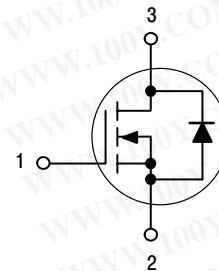


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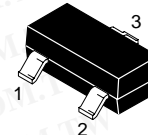
<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(on)} \text{ MAX}$	$I_D \text{ MAX}$
60 V	$7.5 \Omega @ 10 \text{ V}, 500 \text{ mA}$	115 mA

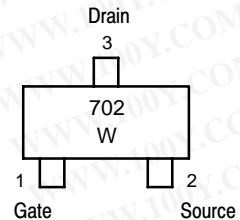
#### N-Channel



#### MARKING DIAGRAM & PIN ASSIGNMENT



SOT-23  
CASE 318  
STYLE 21



702 W = Device Code  
W = Work Week

#### ORDERING INFORMATION

Device	Package	Shipping†
2N7002LT1	SOT-23	3000 Tape & Reel
2N7002LT3		10,000 Tape & Reel
2N7002LT1G	SOT-23 (Pb-free)	3000 Tape & Reel
2N7002LT3G		10,000 Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit	
OFF CHARACTERISTICS						
Drain–Source Breakdown Voltage ( $V_{GS} = 0$ , $I_D = 10\ \mu\text{Adc}$ )	$V_{(BR)DSS}$	60	–	–	Vdc	
Zero Gate Voltage Drain Current ( $V_{GS} = 0$ , $V_{DS} = 60\ \text{Vdc}$ )	$I_{DSS}$	– $T_J = 25^\circ\text{C}$ – $T_J = 125^\circ\text{C}$	– –	1.0 500	$\mu\text{Adc}$	
Gate–Body Leakage Current, Forward ( $V_{GS} = 20\ \text{Vdc}$ )	$I_{GSSF}$	–	–	100	nAdc	
Gate–Body Leakage Current, Reverse ( $V_{GS} = -20\ \text{Vdc}$ )	$I_{GSSR}$	–	–	–100	nAdc	
ON CHARACTERISTICS (Note 5)						
Gate Threshold Voltage ( $V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{Adc}$ )	$V_{GS(th)}$	1.0	–	2.5	Vdc	
On–State Drain Current ( $V_{DS} \geq 2.0\ V_{DS(on)}$ , $V_{GS} = 10\ \text{Vdc}$ )	$I_{D(on)}$	500	–	–	mA	
Static Drain–Source On–State Voltage ( $V_{GS} = 10\ \text{Vdc}$ , $I_D = 500\ \text{mAdc}$ ) ( $V_{GS} = 5.0\ \text{Vdc}$ , $I_D = 50\ \text{mAdc}$ )	$V_{DS(on)}$	– –	– –	3.75 0.375	Vdc	
Static Drain–Source On–State Resistance ( $V_{GS} = 10\ \text{V}$ , $I_D = 500\ \text{mAdc}$ ) ( $V_{GS} = 5.0\ \text{Vdc}$ , $I_D = 50\ \text{mAdc}$ )	$r_{DS(on)}$	– $T_C = 25^\circ\text{C}$ – $T_C = 125^\circ\text{C}$ – $T_C = 25^\circ\text{C}$ – $T_C = 125^\circ\text{C}$	– – – –	7.5 13.5 7.5 13.5	Ohms	
Forward Transconductance ( $V_{DS} \geq 2.0\ V_{DS(on)}$ , $I_D = 200\ \text{mAdc}$ )	$g_{FS}$	80	–	–	mmhos	
DYNAMIC CHARACTERISTICS						
Input Capacitance ( $V_{DS} = 25\ \text{Vdc}$ , $V_{GS} = 0$ , $f = 1.0\ \text{MHz}$ )	$C_{iss}$	–	–	50	pF	
Output Capacitance ( $V_{DS} = 25\ \text{Vdc}$ , $V_{GS} = 0$ , $f = 1.0\ \text{MHz}$ )	$C_{oss}$	–	–	25	pF	
Reverse Transfer Capacitance ( $V_{DS} = 25\ \text{Vdc}$ , $V_{GS} = 0$ , $f = 1.0\ \text{MHz}$ )	$C_{rss}$	–	–	5.0	pF	
SWITCHING CHARACTERISTICS (Note 5)						
Turn–On Delay Time	$(V_{DD} = 25\ \text{Vdc}$ , $I_D \cong 500\ \text{mAdc}$ , $R_G = 25\ \Omega$ , $R_L = 50\ \Omega$ , $V_{gen} = 10\ \text{V}$ )	$t_{d(on)}$	–	–	20	ns
Turn–Off Delay Time		$t_{d(off)}$	–	–	40	ns
BODY–DRAIN DIODE RATINGS						
Diode Forward On–Voltage ( $I_S = 11.5\ \text{mAdc}$ , $V_{GS} = 0\ \text{V}$ )	$V_{SD}$	–	–	–1.5	Vdc	
Source Current Continuous (Body Diode)	$I_S$	–	–	–115	mAdc	
Source Current Pulsed	$I_{SM}$	–	–	–800	mAdc	

5. Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

## TYPICAL ELECTRICAL CHARACTERISTICS

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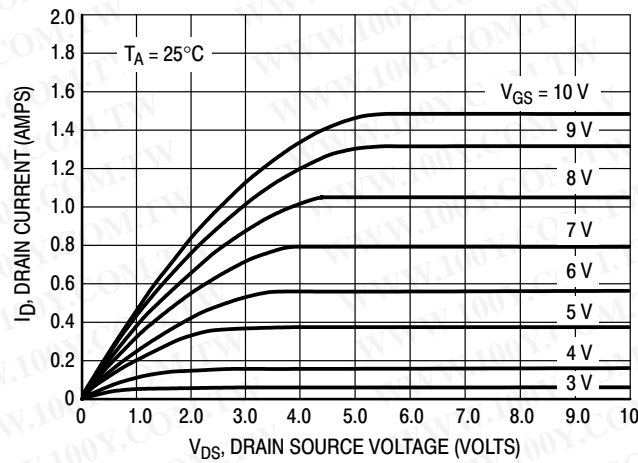


Figure 1. Ohmic Region

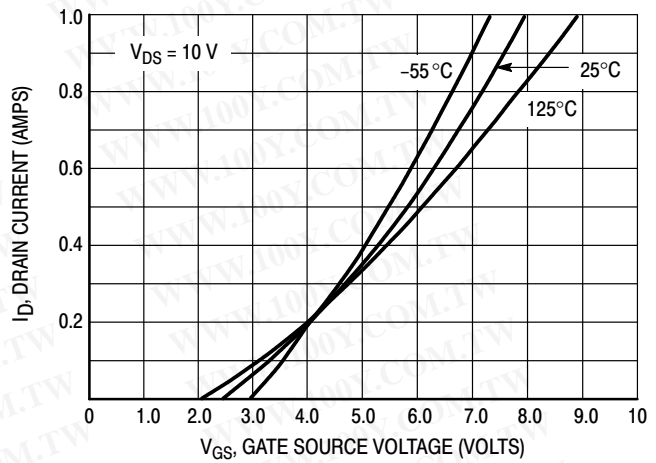


Figure 2. Transfer Characteristics

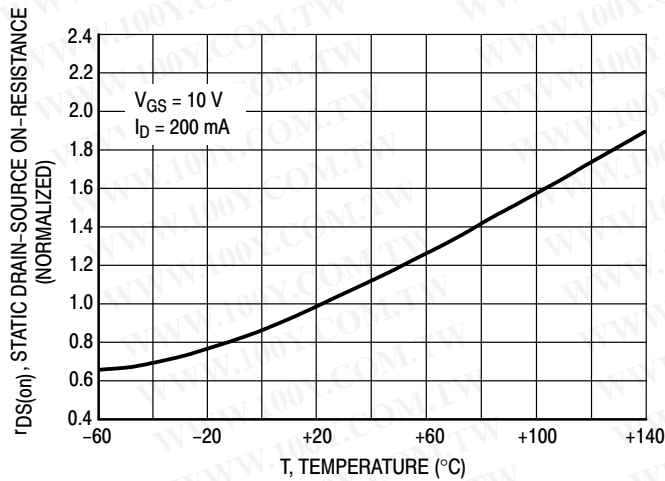


Figure 3. Temperature versus Static Drain-Source On-Resistance

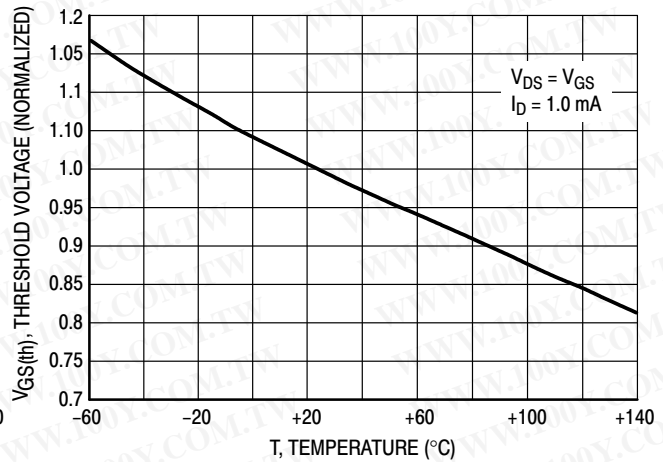


Figure 4. Temperature versus Gate Threshold Voltage

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# PACKAGE DIMENSIONS

SOT-23 (TO-236)

CASE 318-08

ISSUE AH

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## NOTES:

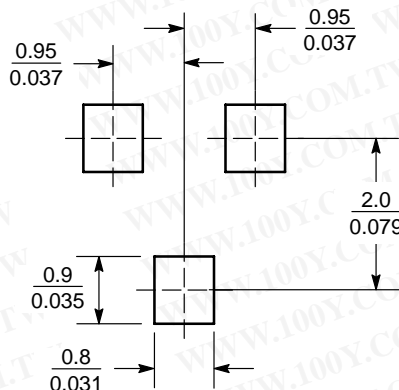
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318-03 AND -07 OBSOLETE, NEW STANDARD 318-08.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.1102	0.1197	2.80	3.04
B	0.0472	0.0551	1.20	1.40
C	0.0350	0.0440	0.89	1.11
D	0.0150	0.0200	0.37	0.50
G	0.0701	0.0807	1.78	2.04
H	0.0005	0.0040	0.013	0.100
J	0.0034	0.0070	0.085	0.177
K	0.0140	0.0285	0.35	0.69
L	0.0350	0.0401	0.89	1.02
S	0.0830	0.1039	2.10	2.64
V	0.0177	0.0236	0.45	0.60


## STYLE 21:

- PIN 1. GATE
- SOURCE
- DRAIN

## SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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