

# 2N7000

Preferred Device

## Small Signal MOSFET 200 mAmps, 60 Volts N-Channel TO-92

### Features

- Pb-Free Packages are Available\*

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain Source Voltage	$V_{DSS}$	60	Vdc
Drain-Gate Voltage ( $R_{GS} = 1.0 \text{ M}\Omega$ )	$V_{DGR}$	60	Vdc
Gate-Source Voltage	$V_{GS}$ $V_{GSM}$	$\pm 20$	Vdc
- Continuous - Non-repetitive ( $t_p \leq 50 \mu\text{s}$ )		$\pm 40$	Vpk
Drain Current	$I_D$ $I_{DM}$	200	mA <sub>dc</sub>
- Continuous - Pulsed		500	
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	350	mW mW/ $^\circ\text{C}$
		2.8	
Operating and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	357	$^\circ\text{C}/\text{W}$
Maximum Lead Temperature for Soldering Purposes, 1/16" from case for 10 seconds	$T_L$	300	$^\circ\text{C}$



ON Semiconductor®

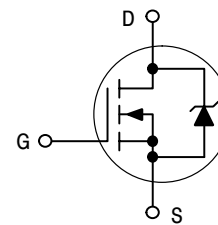
<http://onsemi.com>

200 mAmps

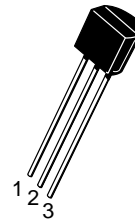
60 Volts

$R_{DS(on)} = 5 \Omega$

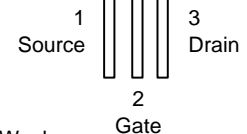
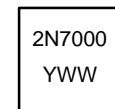
N-Channel



### MARKING DIAGRAM & PIN ASSIGNMENT



TO-92  
CASE 29  
Style 22



Y = Year  
WW = Work Week

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

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

Preferred devices are recommended choices for future use and best overall value.

# 2N7000

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
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### OFF CHARACTERISTICS

Drain–Source Breakdown Voltage (V <sub>GS</sub> = 0, I <sub>D</sub> = 10 μAdc)	V <sub>(BR)DSS</sub>	60	–	Vdc
Zero Gate Voltage Drain Current (V <sub>DS</sub> = 48 Vdc, V <sub>GS</sub> = 0) (V <sub>DS</sub> = 48 Vdc, V <sub>GS</sub> = 0, T <sub>J</sub> = 125°C)	I <sub>DSS</sub>	–	1.0	μAdc mAdc
Gate–Body Leakage Current, Forward (V <sub>GSF</sub> = 15 Vdc, V <sub>DS</sub> = 0)	I <sub>GSSF</sub>	–	–10	nAdc

### ON CHARACTERISTICS (Note 1)

Gate Threshold Voltage (V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 1.0 mAdc)	V <sub>GS(th)</sub>	0.8	3.0	Vdc
Static Drain–Source On–Resistance (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 0.5 Adc) (V <sub>GS</sub> = 4.5 Vdc, I <sub>D</sub> = 75 mAdc)	r <sub>DS(on)</sub>	–	5.0 6.0	Ohm
Drain–Source On–Voltage (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 0.5 Adc) (V <sub>GS</sub> = 4.5 Vdc, I <sub>D</sub> = 75 mAdc)	V <sub>DS(on)</sub>	–	2.5 0.45	Vdc
On–State Drain Current (V <sub>GS</sub> = 4.5 Vdc, V <sub>DS</sub> = 10 Vdc)	I <sub>d(on)</sub>	75	–	mAdc
Forward Transconductance (V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 200 mAdc)	g <sub>fs</sub>	100	–	μmhos

### DYNAMIC CHARACTERISTICS

Input Capacitance	(V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0, f = 1.0 MHz)	C <sub>iss</sub>	–	60	pF
Output Capacitance		C <sub>oss</sub>	–	25	
Reverse Transfer Capacitance		C <sub>rss</sub>	–	5.0	

### SWITCHING CHARACTERISTICS (Note 1)

Turn–On Delay Time	(V <sub>DD</sub> = 15 V, I <sub>D</sub> = 500 mA, R <sub>G</sub> = 25 Ω, R <sub>L</sub> = 30 Ω, V <sub>gen</sub> = 10 V)	t <sub>on</sub>	–	10	ns
Turn–Off Delay Time		t <sub>off</sub>	–	10	

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

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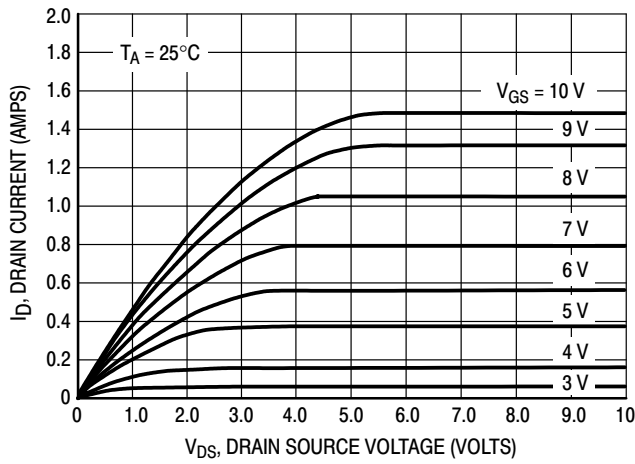


Figure 1. Ohmic Region

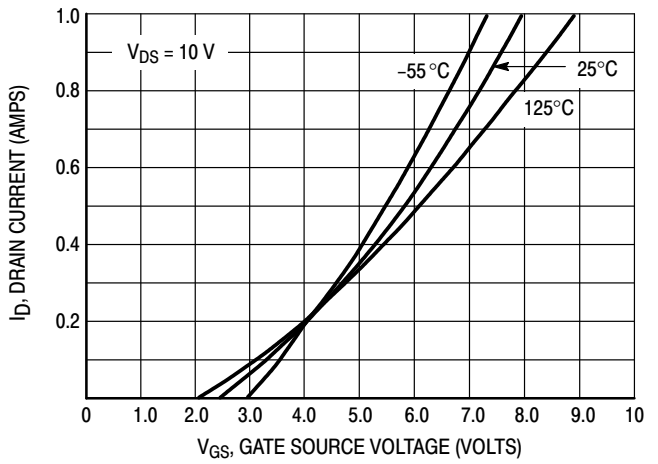


Figure 2. Transfer Characteristics

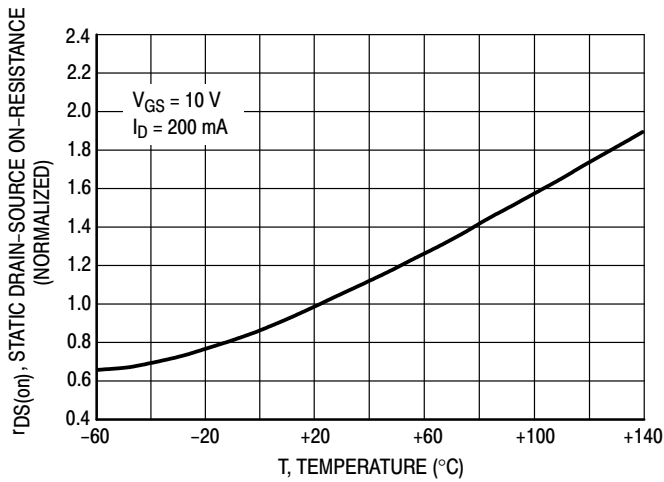


Figure 3. Temperature versus Static Drain-Source On-Resistance

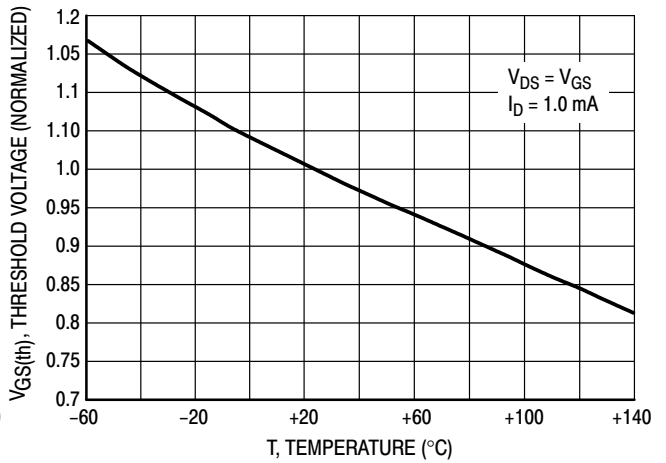


Figure 4. Temperature versus Gate Threshold Voltage

## 2N7000

### ORDERING INFORMATION

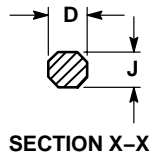
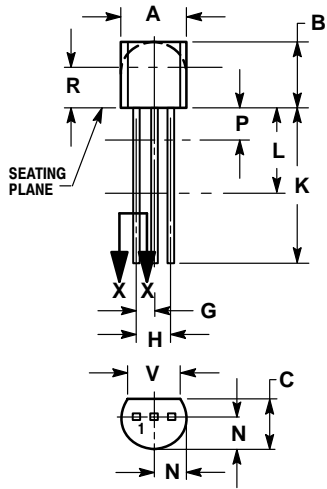
Device	Package	Shipping†
2N7000	TO-92	1000 Unit/Box
2N7000G	TO-92 (Pb-Free)	1000 Unit/Box
2N7000RLRA	TO-92	2000 Tape & Reel
2N7000RLRAG	TO-92 (Pb-Free)	2000 Tape & Reel
2N7000RLRM	TO-92	2000 Ammo Pack
2N7000RLRMG	TO-92 (Pb-Free)	2000 Ammo Pack
2N7000RLRP	TO-92	2000 Ammo Pack
2N7000RLRPG	TO-92 (Pb-Free)	2000 Ammo Pack
2N7000ZL1	TO-92	2000 Ammo Pack
2N7000ZL1G	TO-92 (Pb-Free)	2000 Ammo Pack

†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.

# 2N7000

## PACKAGE DIMENSIONS

TO-92  
CASE 29-11  
ISSUE AL



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.021	0.407	0.533
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	---	12.70	---
L	0.250	---	6.35	---
N	0.080	0.105	2.04	2.66
P	---	0.100	---	2.54
R	0.115	---	2.93	---
V	0.135	---	3.43	---

STYLE 22:

- PIN 1. SOURCE  
2. GATE  
3. DRAIN

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