

# 2N7000

Preferred Device

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

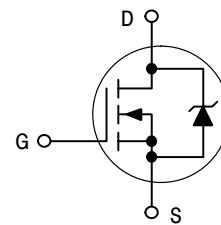


ON Semiconductor

<http://onsemi.com>

**200 mAmps**  
**60 Volts**  
**RDS(on) = 5 Ω**

N-Channel

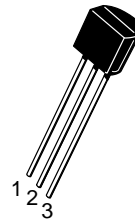


### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	V <sub>DSS</sub>	60	Vdc
Drain-Gate Voltage (R <sub>GS</sub> = 1.0 MΩ)	V <sub>DGR</sub>	60	Vdc
Gate-Source Voltage – Continuous – Non-repetitive (t <sub>p</sub> ≤ 50 μs)	V <sub>GS</sub> V <sub>GSM</sub>	±20 ±40	Vdc Vpk
Drain Current – Continuous – Pulsed	I <sub>D</sub> I <sub>DM</sub>	200 500	mA <sub>dc</sub>
Total Power Dissipation @ T <sub>C</sub> = 25°C Derate above 25°C	P <sub>D</sub>	350 2.8	mW mW/°C
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	–55 to +150	°C

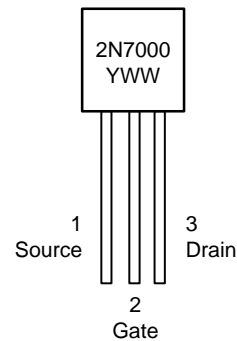
### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	357	°C/W
Maximum Lead Temperature for Soldering Purposes, 1/16" from case for 10 seconds	T <sub>L</sub>	300	°C



TO-92  
CASE 29  
Style 22

### MARKING DIAGRAM & PIN ASSIGNMENT



Y = Year  
WW = Work Week

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 3 of this data sheet.

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 μA <sub>dc</sub> )	V <sub>(BR)DSS</sub>	60	–	V <sub>dc</sub>
Zero Gate Voltage Drain Current (V <sub>DS</sub> = 48 V <sub>dc</sub> , V <sub>GS</sub> = 0) (V <sub>DS</sub> = 48 V <sub>dc</sub> , V <sub>GS</sub> = 0, T <sub>J</sub> = 125°C)	I <sub>DSS</sub>	–	1.0	μA <sub>dc</sub> mA <sub>dc</sub>
Gate–Body Leakage Current, Forward (V <sub>GSS</sub> = 15 V <sub>dc</sub> , V <sub>DS</sub> = 0)	I <sub>GSSF</sub>	–	–10	nA <sub>dc</sub>

### ON CHARACTERISTICS (Note 1.)

Gate Threshold Voltage (V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 1.0 mA <sub>dc</sub> )	V <sub>GS(th)</sub>	0.8	3.0	V <sub>dc</sub>
Static Drain–Source On–Resistance (V <sub>GS</sub> = 10 V <sub>dc</sub> , I <sub>D</sub> = 0.5 A <sub>dc</sub> ) (V <sub>GS</sub> = 4.5 V <sub>dc</sub> , I <sub>D</sub> = 75 mA <sub>dc</sub> )	r <sub>DS(on)</sub>	–	5.0 6.0	Ohm
Drain–Source On–Voltage (V <sub>GS</sub> = 10 V <sub>dc</sub> , I <sub>D</sub> = 0.5 A <sub>dc</sub> ) (V <sub>GS</sub> = 4.5 V <sub>dc</sub> , I <sub>D</sub> = 75 mA <sub>dc</sub> )	V <sub>DS(on)</sub>	–	2.5 0.45	V <sub>dc</sub>
On–State Drain Current (V <sub>GS</sub> = 4.5 V <sub>dc</sub> , V <sub>DS</sub> = 10 V <sub>dc</sub> )	I <sub>d(on)</sub>	75	–	mA <sub>dc</sub>
Forward Transconductance (V <sub>DS</sub> = 10 V <sub>dc</sub> , I <sub>D</sub> = 200 mA <sub>dc</sub> )	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%.

# 2N7000

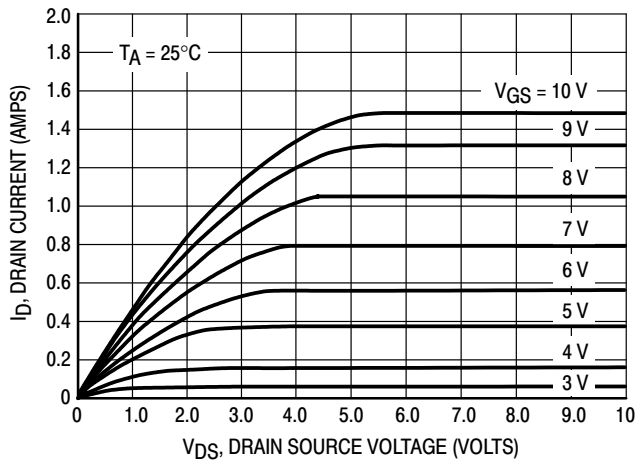


Figure 1. Ohmic Region

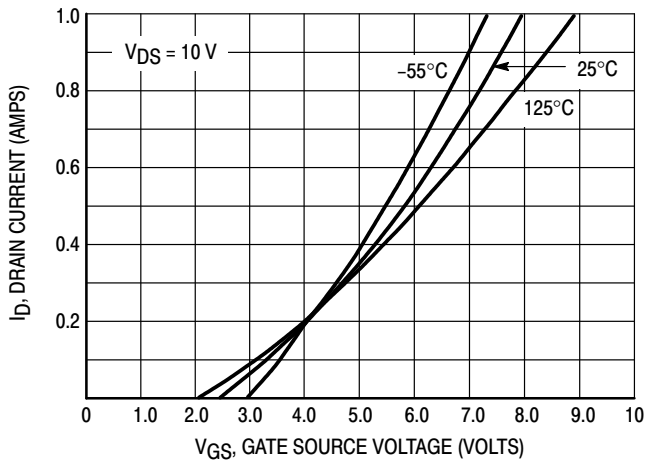


Figure 2. Transfer Characteristics

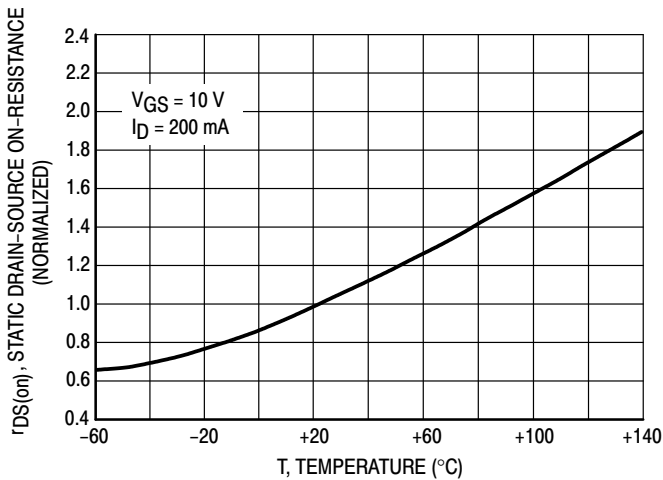


Figure 3. Temperature versus Static Drain-Source On-Resistance

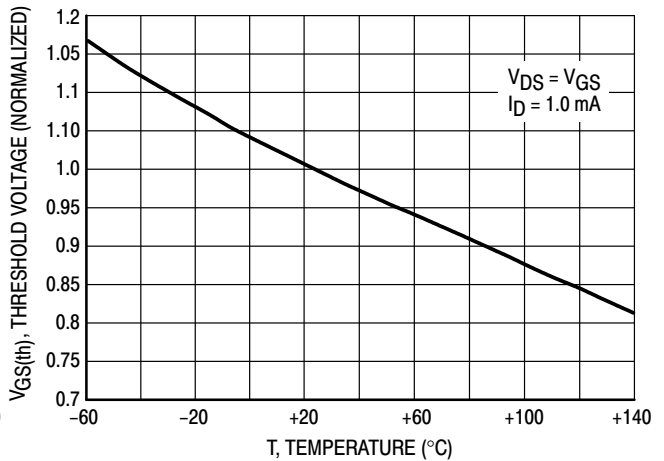


Figure 4. Temperature versus Gate Threshold Voltage

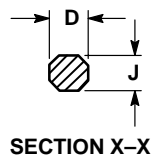
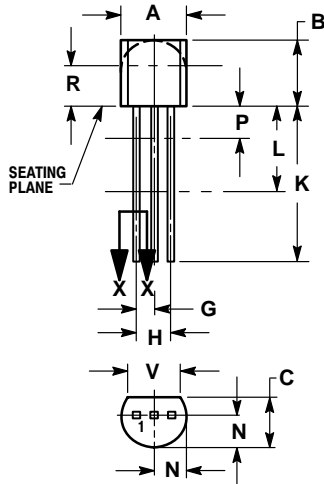
## ORDERING INFORMATION

Device	Package	Shipping
2N7000	TO-92	1000 Unit/Box
2N7000RLRA	TO-92	2000 Tape & Reel
2N7000RLRM	TO-92	2000 Ammo Pack
2N7000RLRP	TO-92	2000 Ammo Pack
2N7000ZL1	TO-92	2000 Ammo Pack

# 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:

1. SOURCE
2. GATE
3. DRAIN

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