# 2N7000

Preferred Device

# Small Signal MOSFET 200 mAmps, 60 Volts

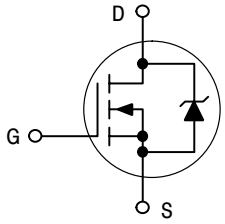
## N–Channel TO–92

ON Semiconductor

http://onsemi.com

**200 mAMPS**
**60 VOLTS**
**$R_{DS(on)}$ = 5 Ω**

**N–Channel**



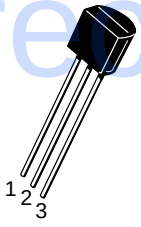

### MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Drain Source Voltage | $V_{DSS}$ | 60 | Vdc |
| Drain–Gate Voltage ($R_{GS}$ = 1.0 MΩ) | $V_{DGR}$ | 60 | Vdc |
| Gate–Source Voltage<br>– Continuous<br>– Non–repetitive ($t_p \le 50$ μs) | <br>$V_{GS}$<br>$V_{GSM}$ | <br>±20<br>±40 | <br>Vdc<br>Vpk |
| Drain Current<br>– Continuous<br>– Pulsed | <br>$I_D$<br>$I_{DM}$ | <br>200<br>500 | mAdc |
| Total Power Dissipation @ $T_C$ = 25°C<br>Derate above 25°C | $P_D$ | 350<br>2.8 | mW<br>mW/°C |
| Operating and Storage Temperature Range | $T_J$, $T_{stg}$ | –55 to +150 | °C |

### THERMAL CHARACTERISTICS

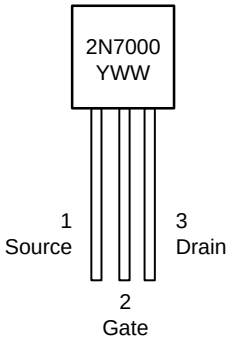
| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance, Junction to Ambient | $R_{\theta JA}$ | 357 | °C/W |
| Maximum Lead Temperature for Soldering Purposes, 1/16″ from case for 10 seconds | $T_L$ | 300 | °C |






**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.

**ELECTRICAL CHARACTERISTICS** ($T_C$ = 25°C unless otherwise noted)

| Characteristic | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | |
| Drain–Source Breakdown Voltage ($V_{GS}$ = 0, $I_D$ = 10 μAdc) | $V_{(BR)DSS}$ | 60 | – | Vdc |
| Zero Gate Voltage Drain Current<br>($V_{DS}$ = 48 Vdc, $V_{GS}$ = 0)<br>($V_{DS}$ = 48 Vdc, $V_{GS}$ = 0, $T_J$ = 125°C) | $I_{DSS}$ | <br>–<br>– | <br>1.0<br>1.0 | <br>μAdc<br>mAdc |
| Gate–Body Leakage Current, Forward ($V_{GSF}$ = 15 Vdc, $V_{DS}$ = 0) | $I_{GSSF}$ | – | –10 | nAdc |
| **ON CHARACTERISTICS** (Note 1.) | | | | |
| Gate Threshold Voltage ($V_{DS}$ = $V_{GS}$, $I_D$ = 1.0 mAdc) | $V_{GS(th)}$ | 0.8 | 3.0 | Vdc |
| Static Drain–Source On–Resistance<br>($V_{GS}$ = 10 Vdc, $I_D$ = 0.5 Adc)<br>($V_{GS}$ = 4.5 Vdc, $I_D$ = 75 mAdc) | $r_{DS(on)}$ | <br>–<br>– | <br>5.0<br>6.0 | Ohm |
| Drain–Source On–Voltage<br>($V_{GS}$ = 10 Vdc, $I_D$ = 0.5 Adc)<br>($V_{GS}$ = 4.5 Vdc, $I_D$ = 75 mAdc) | $V_{DS(on)}$ | <br>–<br>– | <br>2.5<br>0.45 | Vdc |
| On–State Drain Current ($V_{GS}$ = 4.5 Vdc, $V_{DS}$ = 10 Vdc) | $I_{d(on)}$ | 75 | – | mAdc |
| Forward Transconductance ($V_{DS}$ = 10 Vdc, $I_D$ = 200 mAdc) | $g_{fs}$ | 100 | – | μmhos |
| **DYNAMIC CHARACTERISTICS** | | | | |
| Input Capacitance | ($V_{DS}$ = 25 V, $V_{GS}$ = 0, f = 1.0 MHz) | $C_{iss}$ | – | 60 | pF |
| Output Capacitance | | $C_{oss}$ | – | 25 | |
| Reverse Transfer Capacitance | | $C_{rss}$ | – | 5.0 | |
| **SWITCHING CHARACTERISTICS** (Note 1.) | | | | |
| Turn–On Delay Time | ($V_{DD}$ = 15 V, $I_D$ = 500 mA, $R_G$ = 25 Ω, $R_L$ = 30 Ω, $V_{gen}$ = 10 V) | $t_{on}$ | – | 10 | ns |
| Turn–Off Delay Time | | $t_{off}$ | – | 10 | |

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

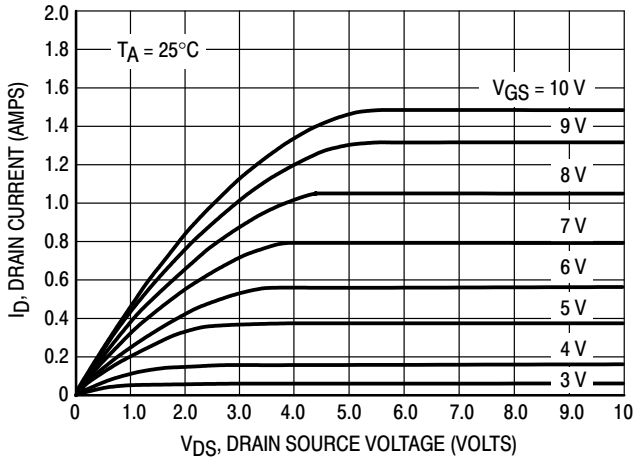



**Figure 1. Ohmic Region**

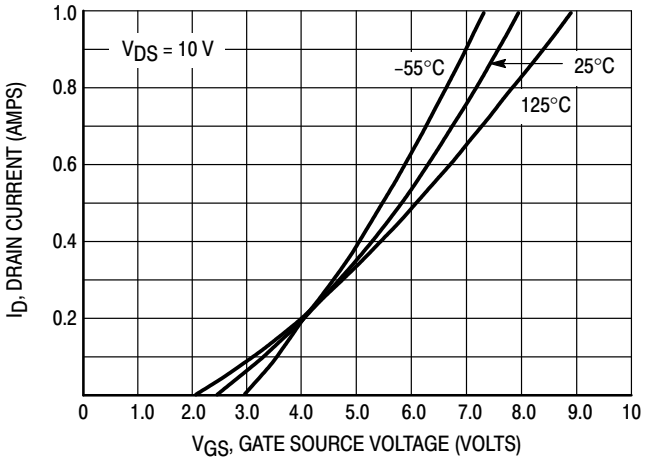



**Figure 2. Transfer Characteristics**

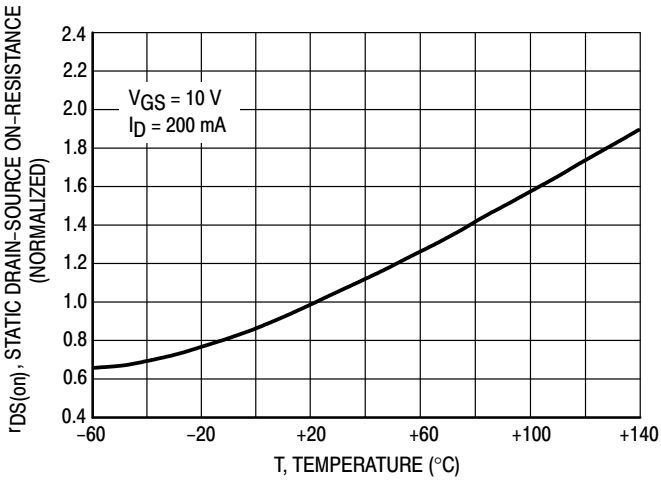



**Figure 3. Temperature versus Static Drain−Source On−Resistance**

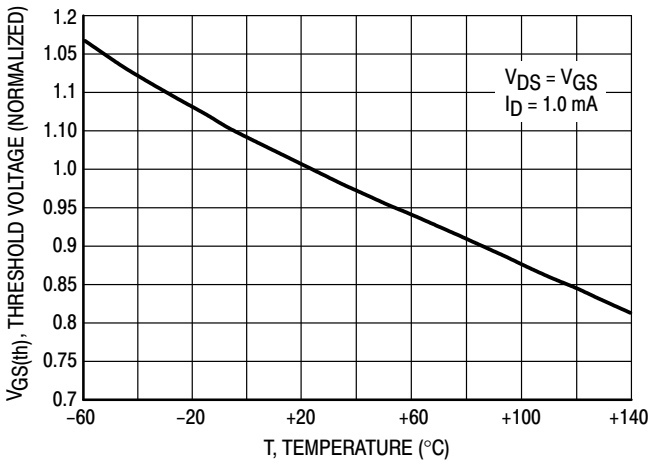


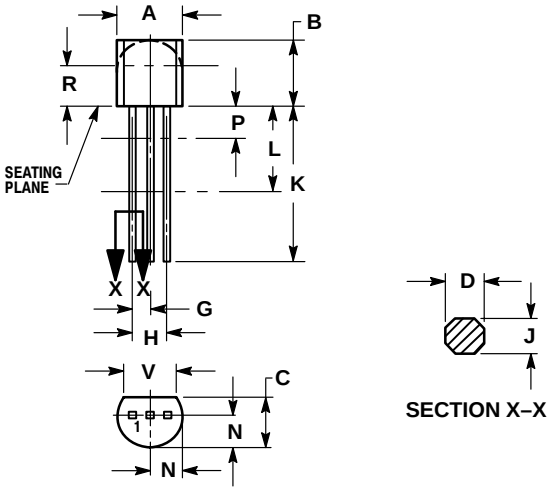

**Figure 4. Temperature versus Gate Threshold Voltage**

## 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 |

## 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.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | 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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