

# 2N7008

## Small-Signal Field Effect Transistor

### N-Channel Enhancement Mode Silicon Gate TMOS

...are designed for high voltage, high speed applications such as switching regulators, converters, solenoid, and relay drivers.

- Silicon Gate for Fast Switching Speeds
- Relay Driver
- Telecommunication Switch
- Automatic Insertable
- Available in Ammo Pack
- Available on Radial Tape and Reel
- N-Channel, Small Signal, TMOS FET

#### MAXIMUM RATINGS

| Rating  | Symbol            | Value           | Unit                       |
|---|-------------------|-----------------|----------------------------|
| Drain-to-Source Voltage   | $V_{DSS}$         | 60              | Vdc                        |
| Drain-to-Gate Voltage ( $R_{GS} = 1 \text{ m}\Omega$ )                                | $V_{DGR}$         | 60              | Vdc                        |
| Gate-to-Source Voltage  | $V_{GS}$          | 40              | Vdc                        |
| Drain Current<br>Continuous<br>Pulsed   | $I_D$<br>$I_{DM}$ | 150<br>1000     | mAdc                       |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$             | 400<br>3.2      | mW<br>mW/ $^\circ\text{C}$ |
| Operating and Storage temperature Range   | $T_J, T_{stg}$    | -5.5 to<br>+150 | $^\circ\text{C}$           |

#### THERMAL CHARACTERISTIC

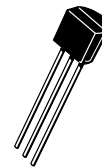
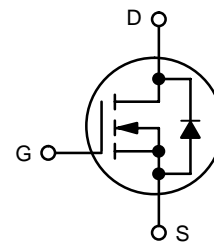
|  |                 |       |                           |
|--|-----------------|-------|---------------------------|
| Thermal Resistance Junction-to-Ambient   | $R_{\theta JA}$ | 312.5 | $^\circ\text{C}/\text{W}$ |
| Maximum Lead Temperature for Soldering<br>Purposes, 1/16 in from Case for 10 Seconds | $T_L$           | 300   | $^\circ\text{C}$          |



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**N-CHANNEL SMALL SIGNAL  
TMOS FET,  $R_{DS(ON)} = 7.5 \Omega$ , 60 V**



TO-92 (TO-226)  
CASE 29

#### MARKING DIAGRAM



## 2N7008

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

| Characteristics   | Symbol               | Min | Max        | Unit |
|---|----------------------|-----|------------|------|
| <b>OFF CHARACTERISTICS</b>  |                      |     |            |      |
| Drain-to-Source Breakdown Voltage<br>(V <sub>GS</sub> = 0, I <sub>D</sub> = 100 μA)   | V <sub>(BR)DSS</sub> | 60  | –          | Vdc  |
| Zero Gate Voltage Drain Current<br>(V <sub>DS</sub> = 50 V, V <sub>GS</sub> = 0)<br>(V <sub>DS</sub> = 50 V, V <sub>GS</sub> = 0, T <sub>J</sub> = 125°C) | I <sub>DSS</sub>     | –   | 1.0<br>500 | μAdc |
| Gate-to-Body Leakage Current, Forward<br>(V <sub>GSF</sub> = 30 Vdc, V <sub>DS</sub> = 0)   | I <sub>GSSF</sub>    | –   | –100       | nAdc |

### ON CHARACTERISTICS (Note 1)

|  |                     |     |             |       |
|--|---------------------|-----|-------------|-------|
| Gate Threshold Voltage (V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 mA)   | V <sub>GS(th)</sub> | –   | –           | Vdc   |
| Static Drain-to-Source On-Resistance<br>(V <sub>GS</sub> = 5 Vdc, I <sub>D</sub> = 50 mAdc)<br>(V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 500 mA, T <sub>C</sub> = 125°C) | R <sub>DS(ON)</sub> | –   | 7.5<br>13.5 | Ω     |
| Drain-to-Source On-Voltage<br>(V <sub>GS</sub> = 5 V, I <sub>D</sub> = 50 mA)<br>(V <sub>GS</sub> = 10 V, I <sub>D</sub> = 500 mA)   | V <sub>DS(ON)</sub> | –   | 1.5<br>3.75 | Vdc   |
| On-State Drain Current (V <sub>GS</sub> = 10 V, V <sub>DS</sub> ≥ 2 V <sub>DS(ON)</sub> )  | I <sub>D(ON)</sub>  | 500 | –           | mA    |
| Forward Transconductance (V <sub>DS</sub> ≥ 2 V <sub>DS(ON)</sub> , I <sub>D</sub> = 200 mA)   | g <sub>FS</sub>     | 80  | –           | μmhos |

### DYNAMIC CHARACTERISTICS

|                              |  |                  |   |    |    |
|------------------------------|--|------------------|---|----|----|
| Input Capacitance            | V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0<br>f = 1 MHz | C <sub>ISS</sub> | – | 50 | pF |
| Output Capacitance           |  | C <sub>OSS</sub> | – | 25 |    |
| Reverse Transfer Capacitance |  | C <sub>RSS</sub> | – | 5  |    |

### SWITCHING CHARACTERISTICS (Note 1)

|                     |  |                  |   |    |    |
|---------------------|--|------------------|---|----|----|
| Turn-on Delay Time  | V <sub>DD</sub> = 30 V, I <sub>D</sub> = 200 mA<br>R <sub>GEN</sub> = 25 Ω, R <sub>L</sub> = 150 Ω | t <sub>ON</sub>  | – | 20 | ns |
| Turn-off Delay Time |  | t <sub>OFF</sub> | – | 20 |    |

1. Pulse Test Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

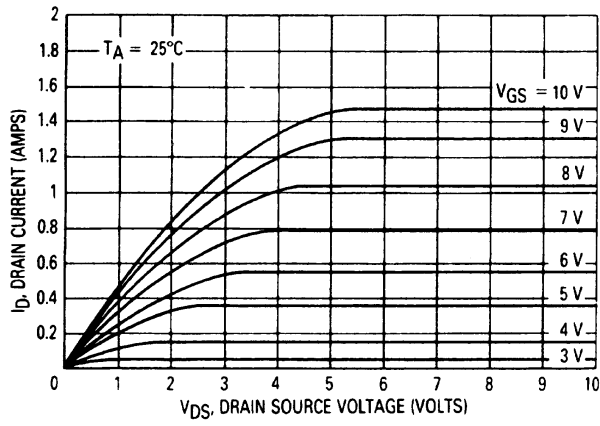


Figure 1. Ohmic Region

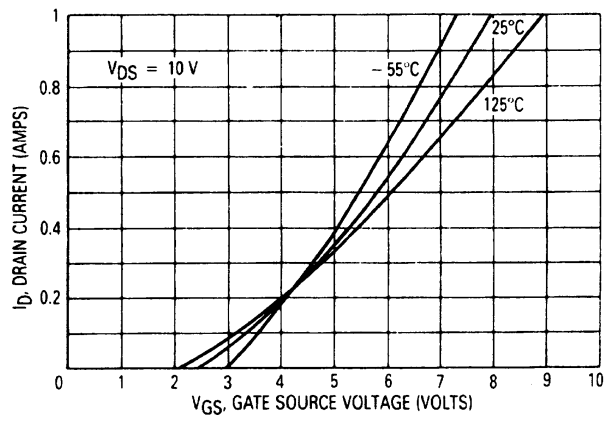


Figure 2. Transfer Characteristics

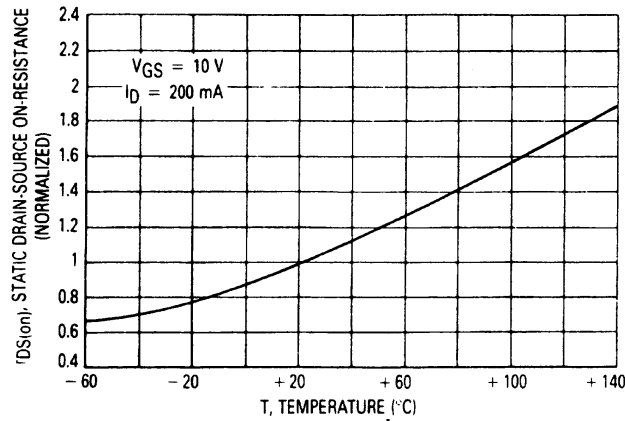


Figure 3. Temperature versus Static Drain-Source On-Resistance

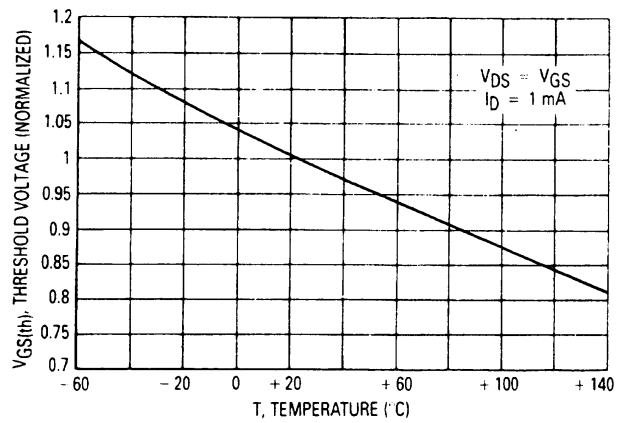
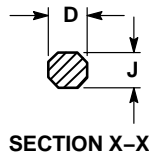
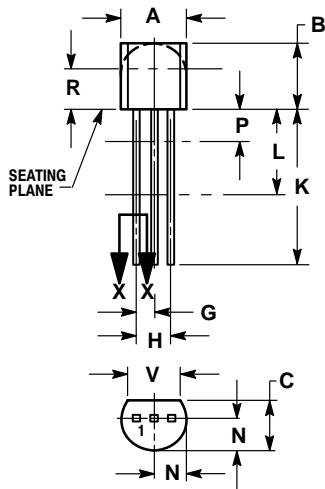


Figure 4. Temperature versus Gate Threshold Voltage

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## PACKAGE DIMENSIONS

### TO-92 (TO-226) CASE 29 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        | ---   |

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