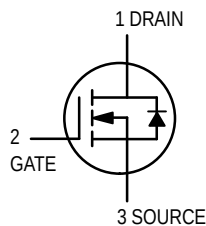
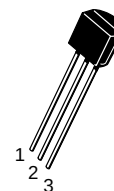


# TMOS FET Switching

## N-Channel — Enhancement



**BS170**



CASE 29-04, STYLE 30  
TO-92 (TO-226AA)

### MAXIMUM RATINGS

| Rating                                                                          | Symbol                | Value                | Unit       |
|---------------------------------------------------------------------------------|-----------------------|----------------------|------------|
| Drain-Source Voltage                                                            | $V_{DS}$              | 60                   | Vdc        |
| Gate-Source Voltage<br>— Continuous<br>— Non-repetitive ( $t_p \leq 50 \mu s$ ) | $V_{GS}$<br>$V_{GSM}$ | $\pm 20$<br>$\pm 40$ | Vdc<br>Vpk |
| Drain Current <sup>(1)</sup>                                                    | $I_D$                 | 0.5                  | Adc        |
| Total Device Dissipation @ $T_A = 25^\circ C$                                   | $P_D$                 | 350                  | mW         |
| Operating and Storage Junction Temperature Range                                | $T_J, T_{stg}$        | -55 to +150          | $^\circ C$ |

### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ C$ unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|                                                                     |               |    |      |    |      |
|---------------------------------------------------------------------|---------------|----|------|----|------|
| Gate Reverse Current<br>( $V_{GS} = 15 \text{ Vdc}, V_{DS} = 0$ )   | $I_{GSS}$     | —  | 0.01 | 10 | nAdc |
| Drain-Source Breakdown Voltage<br>( $V_{GS} = 0, I_D = 100 \mu A$ ) | $V_{(BR)DSS}$ | 60 | 90   | —  | Vdc  |

### ON CHARACTERISTICS<sup>(2)</sup>

|                                                                                            |              |     |     |     |          |
|--------------------------------------------------------------------------------------------|--------------|-----|-----|-----|----------|
| Gate Threshold Voltage<br>( $V_{DS} = V_{GS}, I_D = 1.0 \text{ mAdc}$ )                    | $V_{GS(Th)}$ | 0.8 | 2.0 | 3.0 | Vdc      |
| Static Drain-Source On Resistance<br>( $V_{GS} = 10 \text{ Vdc}, I_D = 200 \text{ mAdc}$ ) | $r_{DS(on)}$ | —   | 1.8 | 5.0 | $\Omega$ |
| Drain Cutoff Current<br>( $V_{DS} = 25 \text{ Vdc}, V_{GS} = 0 \text{ Vdc}$ )              | $I_{D(off)}$ | —   | —   | 0.5 | $\mu A$  |
| Forward Transconductance<br>( $V_{DS} = 10 \text{ Vdc}, I_D = 250 \text{ mAdc}$ )          | $g_{fs}$     | —   | 200 | —   | mmhos    |

### SMALL-SIGNAL CHARACTERISTICS

|                                                                                     |           |   |   |    |    |
|-------------------------------------------------------------------------------------|-----------|---|---|----|----|
| Input Capacitance<br>( $V_{DS} = 10 \text{ Vdc}, V_{GS} = 0, f = 1.0 \text{ MHz}$ ) | $C_{iss}$ | — | — | 60 | pF |
|-------------------------------------------------------------------------------------|-----------|---|---|----|----|

### SWITCHING CHARACTERISTICS

|                                                           |           |   |     |    |    |
|-----------------------------------------------------------|-----------|---|-----|----|----|
| Turn-On Time<br>( $I_D = 0.2 \text{ Adc}$ ) See Figure 1  | $t_{on}$  | — | 4.0 | 10 | ns |
| Turn-Off Time<br>( $I_D = 0.2 \text{ Adc}$ ) See Figure 1 | $t_{off}$ | — | 4.0 | 10 | ns |

1. The Power Dissipation of the package may result in a lower continuous drain current.
2. Pulse Test: Pulse Width  $\leq 300 \mu s$ , Duty Cycle  $\leq 2.0\%$ .

## RESISTIVE SWITCHING

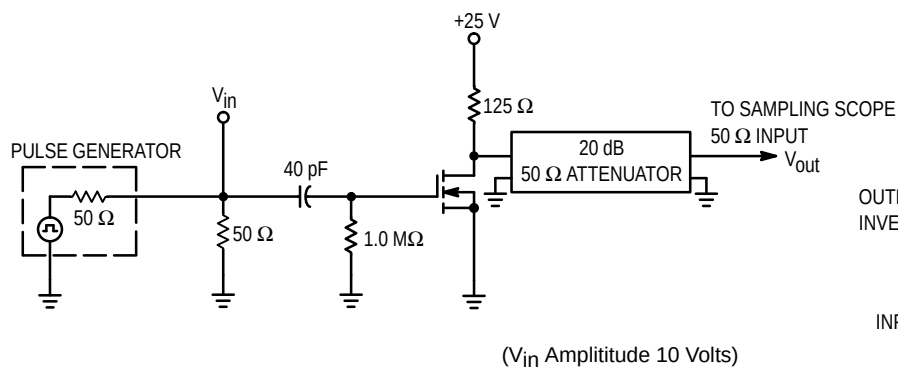


Figure 1. Switching Test Circuit

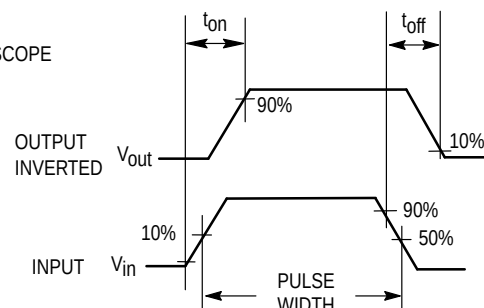


Figure 2. Switching Waveforms

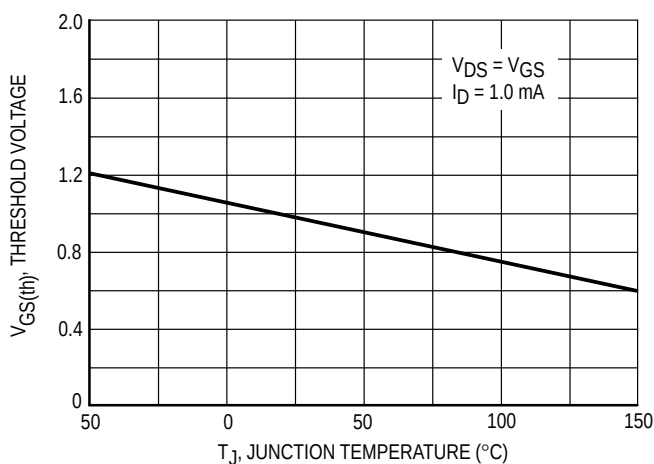
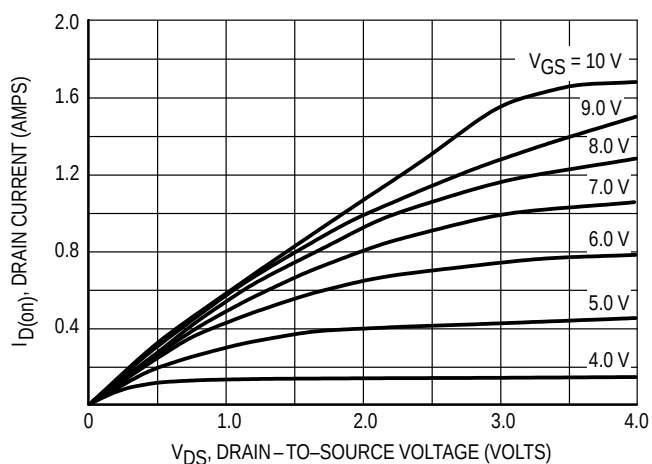
Figure 3.  $V_{GS(th)}$  Normalized versus Temperature

Figure 4. On-Region Characteristics

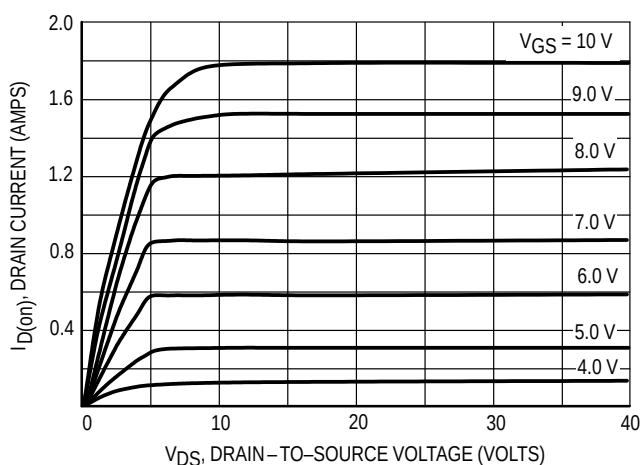
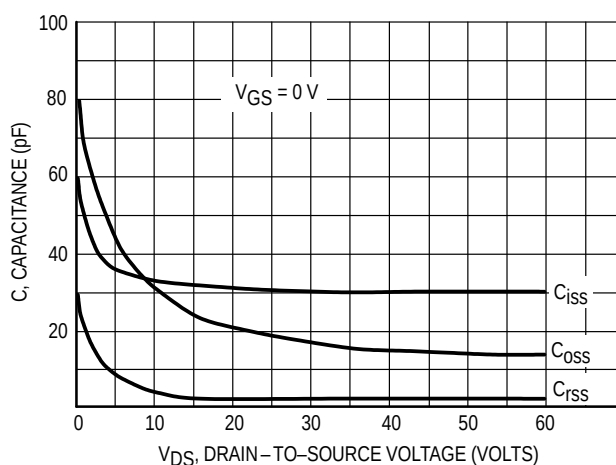
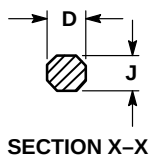
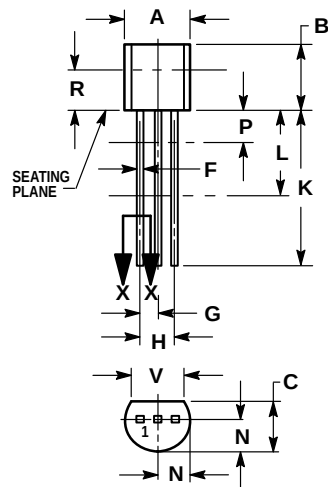


Figure 5. Output Characteristics

Figure 6. Capacitance versus  
Drain-To-Source Voltage

## PACKAGE DIMENSIONS



## NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. DIMENSION F APPLIES BETWEEN P AND L. DIMENSION D AND J APPLY BETWEEN L AND K MINIMUM. 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  | 0.022 | 0.41        | 0.55 |
| F   | 0.016  | 0.019 | 0.41        | 0.48 |
| 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        | —    |

**CASE 029-04  
(TO-226AA)  
ISSUE AD**

## STYLE 30:

- PIN 1. DRAIN  
2. GATE  
3. SOURCE

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