

# BS170

Preferred Device

## Small Signal MOSFET 500 mA, 60 V N-Channel TO-92 (TO-226)

### Features

- Pb-Free Package is Available\*

### MAXIMUM RATINGS

| Rating                                           | Symbol         | Value       | Unit       |
|--------------------------------------------------|----------------|-------------|------------|
| Drain-Source Voltage                             | $V_{DS}$       | 60          | Vdc        |
| Gate-Source Voltage                              | $V_{GS}$       | $\pm 20$    | Vdc        |
| – Continuous                                     | $V_{GSM}$      | $\pm 40$    | Vpk        |
| – Non-repetitive ( $t_p \leq 50 \mu s$ )         |                |             |            |
| Drain Current (Note)                             | $I_D$          | 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 | $^\circ C$ |

- The Power Dissipation of the package may result in a lower continuous drain current.



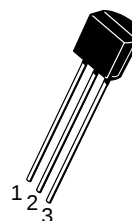
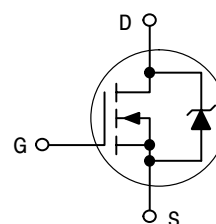
ON Semiconductor®

<http://onsemi.com>

500 mA, 60 V

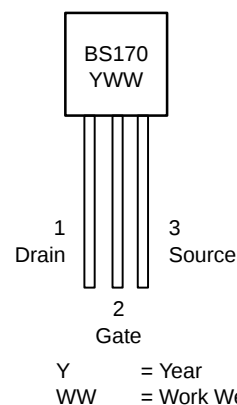
$R_{DS(on)} = 5 \Omega$

N-Channel



TO-92 (TO-226)  
CASE 29  
STYLE 30

### MARKING DIAGRAM & PIN ASSIGNMENT



### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 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.

# BS170

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

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

### OFF CHARACTERISTICS

|                                                                                    |                      |    |      |    |      |
|------------------------------------------------------------------------------------|----------------------|----|------|----|------|
| Gate Reverse Current<br>(V <sub>GS</sub> = 15 Vdc, V <sub>DS</sub> = 0)            | I <sub>GSS</sub>     | –  | 0.01 | 10 | nAdc |
| Drain–Source Breakdown Voltage<br>(V <sub>GS</sub> = 0, I <sub>D</sub> = 100 µAdc) | V <sub>(BR)DSS</sub> | 60 | 90   | –  | Vdc  |

### ON CHARACTERISTICS (Note 1)

|                                                                                            |                     |     |     |     |       |
|--------------------------------------------------------------------------------------------|---------------------|-----|-----|-----|-------|
| Gate Threshold Voltage<br>(V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 1.0 mAdc)  | V <sub>GS(Th)</sub> | 0.8 | 2.0 | 3.0 | Vdc   |
| Static Drain–Source On Resistance<br>(V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 200 mAdc) | r <sub>DS(on)</sub> | –   | 1.8 | 5.0 | Ω     |
| Drain Cutoff Current<br>(V <sub>DS</sub> = 25 Vdc, V <sub>GS</sub> = 0 Vdc)                | I <sub>D(off)</sub> | –   | –   | 0.5 | µA    |
| Forward Transconductance<br>(V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 250 mAdc)          | g <sub>fs</sub>     | –   | 200 | –   | mmhos |

### SMALL–SIGNAL CHARACTERISTICS

|                                                                                   |                  |   |   |    |    |
|-----------------------------------------------------------------------------------|------------------|---|---|----|----|
| Input Capacitance<br>(V <sub>DS</sub> = 10 Vdc, V <sub>GS</sub> = 0, f = 1.0 MHz) | C <sub>iss</sub> | – | – | 60 | pF |
|-----------------------------------------------------------------------------------|------------------|---|---|----|----|

### SWITCHING CHARACTERISTICS

|                                                          |                  |   |     |    |    |
|----------------------------------------------------------|------------------|---|-----|----|----|
| Turn–On Time<br>(I <sub>D</sub> = 0.2 Adc) See Figure 1  | t <sub>on</sub>  | – | 4.0 | 10 | ns |
| Turn–Off Time<br>(I <sub>D</sub> = 0.2 Adc) See Figure 1 | t <sub>off</sub> | – | 4.0 | 10 | ns |

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

## ORDERING INFORMATION

| Device    | Package                     | Shipping <sup>†</sup> |
|-----------|-----------------------------|-----------------------|
| BS170     | TO–92 (TO–226)              | 1000 Unit / Box       |
| BS170G    | TO–92 (TO–226)<br>(Pb–Free) | 1000 Unit / Box       |
| BS170RLRA | TO–92 (TO–226)              | 2000 Tape & Reel      |
| BS170RLRM |                             | 2000 Tape & Ammo Box  |
| BS170RLRP |                             | 2000 Tape & Ammo Box  |
| BS170RL1  |                             | 2000 Tape & Reel      |
| BS170ZL1  |                             | 2000 Tape & Ammo Box  |

<sup>†</sup>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.

## RESISTIVE SWITCHING

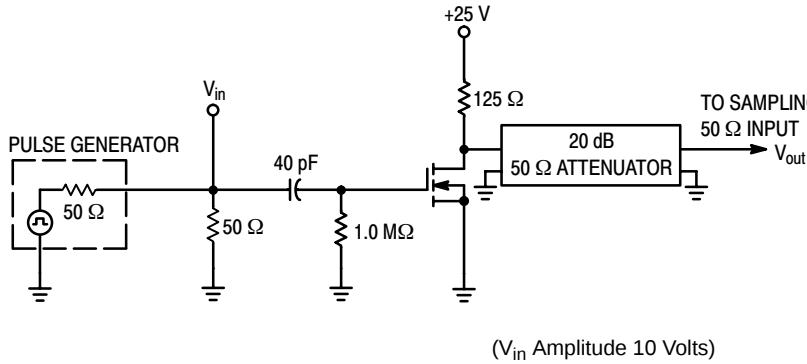


Figure 1. Switching Test Circuit

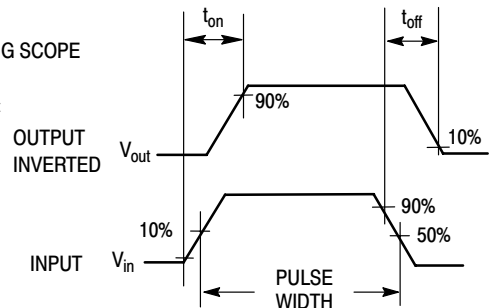


Figure 2. Switching Waveforms

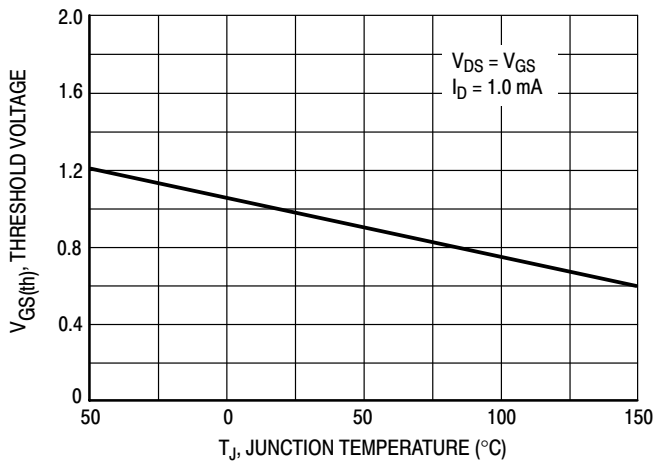
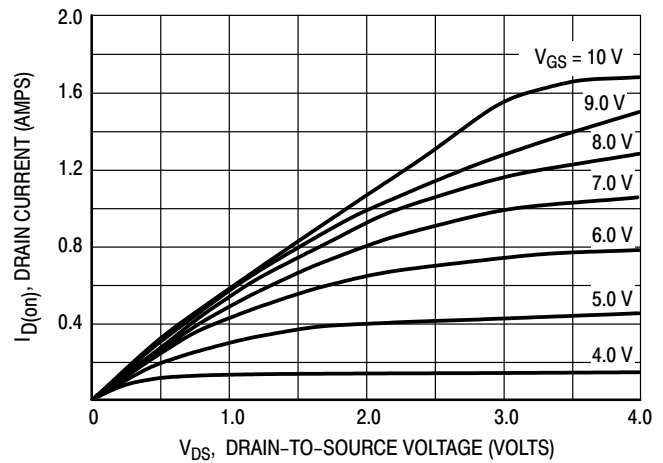
Figure 3.  $V_{GS(th)}$  Normalized versus Temperature

Figure 4. On-Region Characteristics

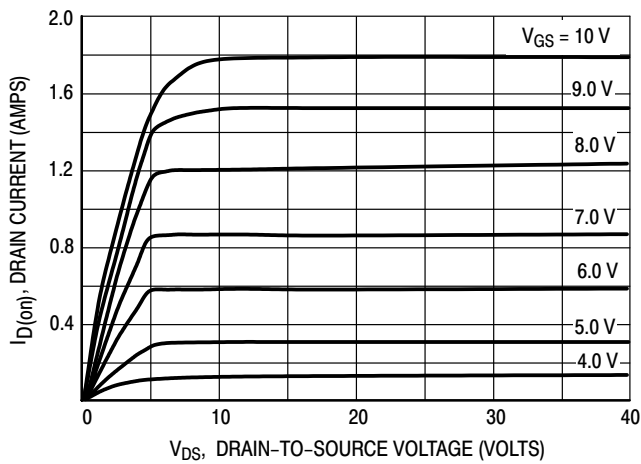
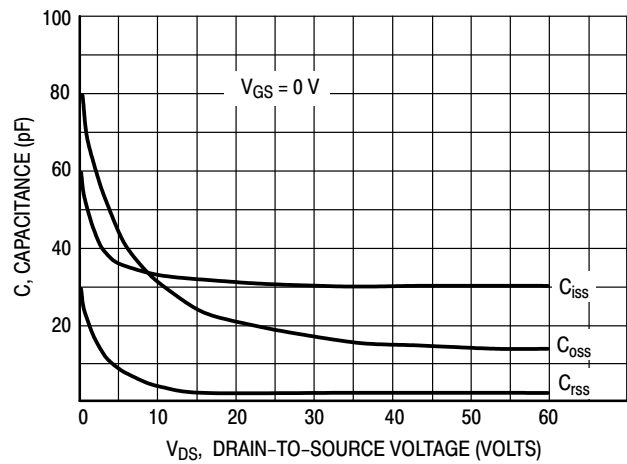


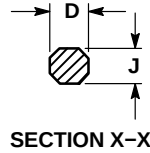
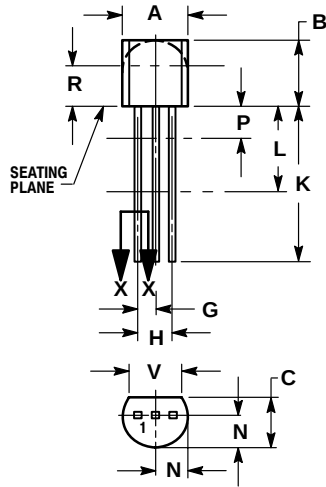
Figure 5. Output Characteristics

Figure 6. Capacitance versus  
Drain-To-Source Voltage

# BS170

## PACKAGE DIMENSIONS

### TO-92 (TO-226) 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 30:

1. DRAIN
2. GATE
3. SOURCE

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