

# BS170

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

### Features

- This is a Pb-Free Device\*

### 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	$^\circ C$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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

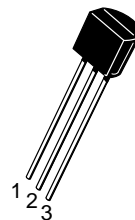
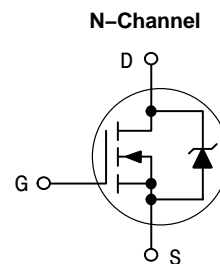
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



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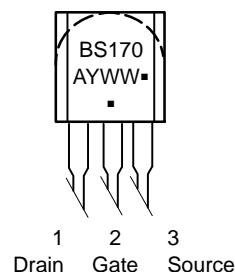
[www.onsemi.com](http://www.onsemi.com)

500 mA, 60 Volts  
 $R_{DS(on)} = 5.0 \Omega$



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

### MARKING DIAGRAM & PIN ASSIGNMENT



A = Assembly Location  
Y = Year  
WW = Work Week  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

# BS170

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

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Gate Reverse Current (V <sub>GS</sub> = 15 Vdc, V <sub>DS</sub> = 0)	I <sub>GSS</sub>	–	0.01	10	nAdc
Drain–Source Breakdown Voltage (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 (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 (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 (V <sub>DS</sub> = 25 Vdc, V <sub>GS</sub> = 0 Vdc)	I <sub>D(off)</sub>	–	–	0.5	µA
Forward Transconductance (V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 250 mAdc)	g <sub>fs</sub>	–	200	–	mmhos

### SMALL–SIGNAL CHARACTERISTICS

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

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

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

## ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
BS170	TO–92 (TO–226) (Pb–Free)	1000 Unit/Tube
BS170RLRAG	TO–92 (TO–226) (Pb–Free)	2000 Tape & Reel

<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

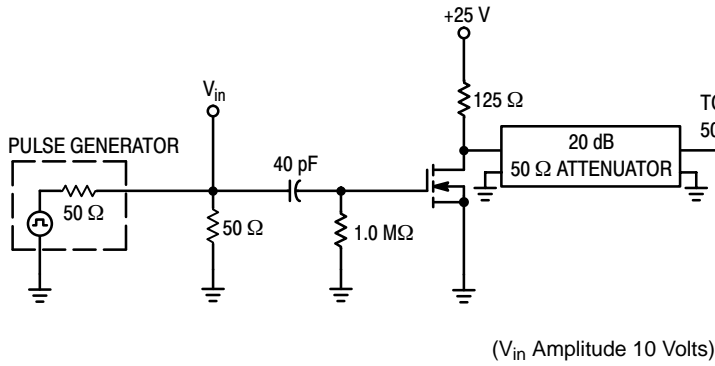


Figure 1. Switching Test Circuit

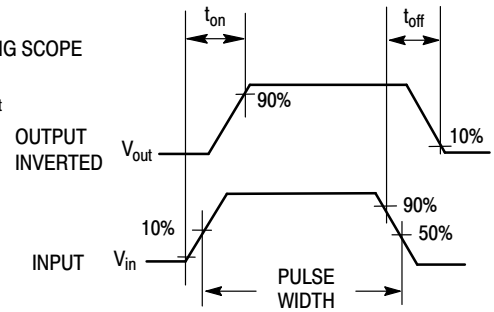


Figure 2. Switching Waveforms

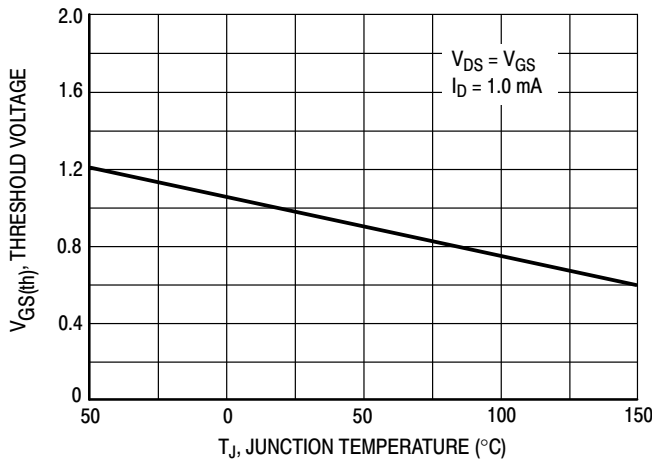
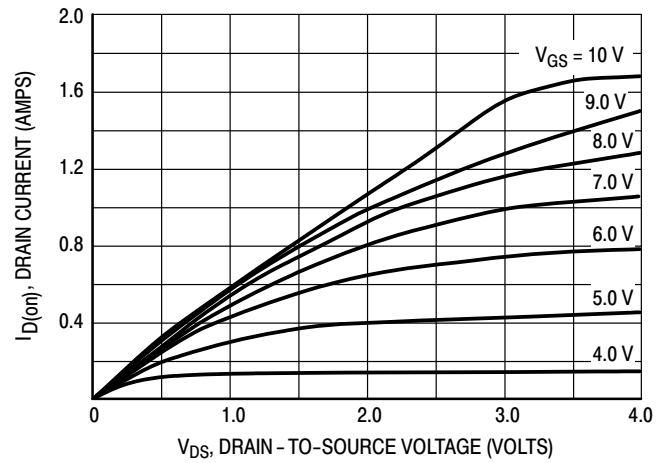
Figure 3.  $V_{GS(th)}$  Normalized versus Temperature

Figure 4. On-Region Characteristics

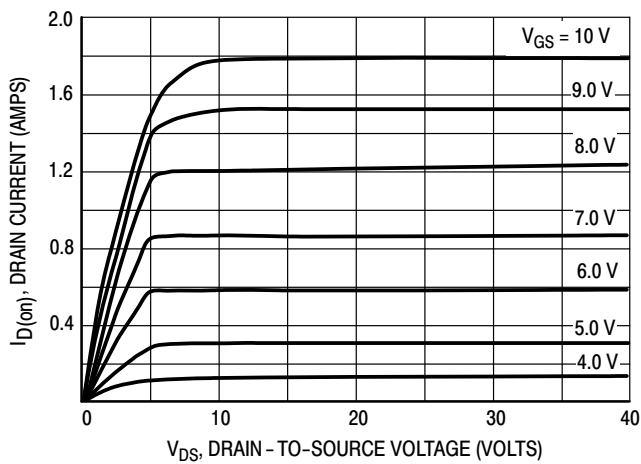
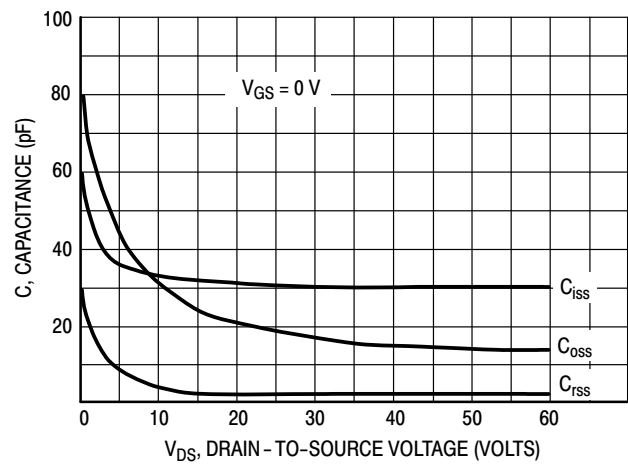


Figure 5. Output Characteristics

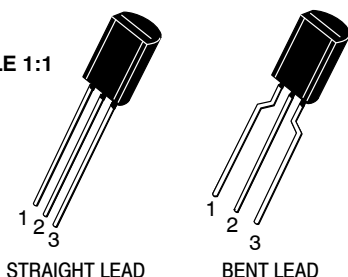
Figure 6. Capacitance versus  
Drain-To-Source Voltage

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

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ON

SCALE 1:1

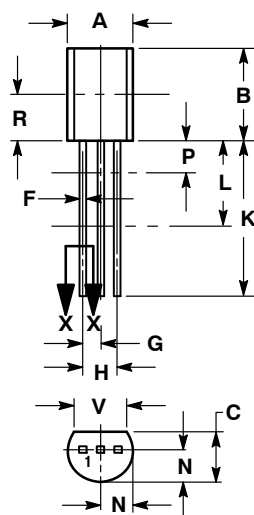


STRAIGHT LEAD

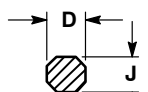
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CASE 29-10  
ISSUE A

DATE 08 MAY 2012



STRAIGHT LEAD

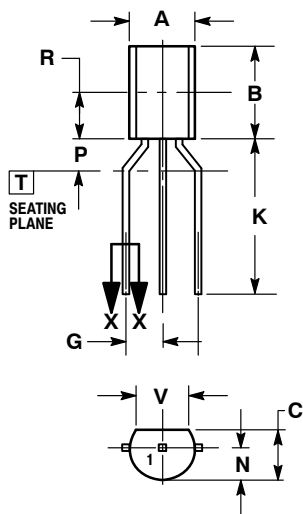


SECTION X-X

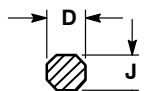
## NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. DIMENSION F APPLIES BETWEEN DIMENSIONS P AND L. DIMENSIONS D AND J APPLY BETWEEN DIMENSIONS L AND K MINIMUM. THE LEAD DIMENSIONS ARE UNCONTROLLED IN DIMENSION P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.44	5.21
B	0.290	0.310	7.37	7.87
C	0.125	0.165	3.18	4.19
D	0.018	0.021	0.46	0.53
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	0.018	0.024	0.46	0.61
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	0.135	---	3.43	---
V	0.135	---	3.43	---



BENT LEAD



SECTION X-X


## NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
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## STYLES ON PAGE 2

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**CASE 29-10**  
**ISSUE A**

DATE 08 MAY 2012

<b>STYLE 1:</b> PIN 1. EMITTER 2. BASE 3. COLLECTOR	<b>STYLE 2:</b> PIN 1. BASE 2. EMITTER 3. COLLECTOR	<b>STYLE 3:</b> PIN 1. ANODE 2. ANODE 3. CATHODE	<b>STYLE 4:</b> PIN 1. CATHODE 2. CATHODE 3. ANODE	<b>STYLE 5:</b> PIN 1. DRAIN 2. SOURCE 3. GATE
<b>STYLE 6:</b> PIN 1. GATE 2. SOURCE & SUBSTRATE 3. DRAIN	<b>STYLE 7:</b> PIN 1. SOURCE 2. DRAIN 3. GATE	<b>STYLE 8:</b> PIN 1. DRAIN 2. GATE 3. SOURCE & SUBSTRATE	<b>STYLE 9:</b> PIN 1. BASE 1 2. EMITTER 3. BASE 2	<b>STYLE 10:</b> PIN 1. CATHODE 2. GATE 3. ANODE
<b>STYLE 11:</b> PIN 1. ANODE 2. CATHODE & ANODE 3. CATHODE	<b>STYLE 12:</b> PIN 1. MAIN TERMINAL 1 2. GATE 3. MAIN TERMINAL 2	<b>STYLE 13:</b> PIN 1. ANODE 1 2. GATE 3. CATHODE 2	<b>STYLE 14:</b> PIN 1. EMITTER 2. COLLECTOR 3. BASE	<b>STYLE 15:</b> PIN 1. ANODE 1 2. CATHODE 3. ANODE 2
<b>STYLE 16:</b> PIN 1. ANODE 2. GATE 3. CATHODE	<b>STYLE 17:</b> PIN 1. COLLECTOR 2. BASE 3. EMITTER	<b>STYLE 18:</b> PIN 1. ANODE 2. CATHODE 3. NOT CONNECTED	<b>STYLE 19:</b> PIN 1. GATE 2. ANODE 3. CATHODE	<b>STYLE 20:</b> PIN 1. NOT CONNECTED 2. CATHODE 3. ANODE
<b>STYLE 21:</b> PIN 1. COLLECTOR 2. EMITTER 3. BASE	<b>STYLE 22:</b> PIN 1. SOURCE 2. GATE 3. DRAIN	<b>STYLE 23:</b> PIN 1. GATE 2. SOURCE 3. DRAIN	<b>STYLE 24:</b> PIN 1. EMITTER 2. COLLECTOR/ANODE 3. CATHODE	<b>STYLE 25:</b> PIN 1. MT 1 2. GATE 3. MT 2
<b>STYLE 26:</b> PIN 1. V <sub>CC</sub> 2. GROUND 2 3. OUTPUT	<b>STYLE 27:</b> PIN 1. MT 2. SUBSTRATE 3. MT	<b>STYLE 28:</b> PIN 1. CATHODE 2. ANODE 3. GATE	<b>STYLE 29:</b> PIN 1. NOT CONNECTED 2. ANODE 3. CATHODE	<b>STYLE 30:</b> PIN 1. DRAIN 2. GATE 3. SOURCE
<b>STYLE 31:</b> PIN 1. GATE 2. DRAIN 3. SOURCE	<b>STYLE 32:</b> PIN 1. BASE 2. COLLECTOR 3. EMITTER	<b>STYLE 33:</b> PIN 1. RETURN 2. INPUT 3. OUTPUT	<b>STYLE 34:</b> PIN 1. INPUT 2. GROUND 3. LOGIC	<b>STYLE 35:</b> PIN 1. GATE 2. COLLECTOR 3. EMITTER

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