BS170

Small Signal MOSFET 500 mA, 60 Volts

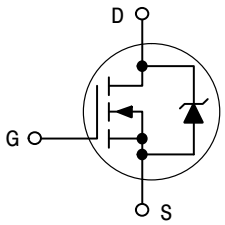
N−Channel TO−92 (TO−226)

ON Semiconductor®

www.onsemi.com

500 mA, 60 Volts
$R_{DS(on)}$ = 5.0 Ω

N−Channel



Features

- This is a Pb−Free Device*

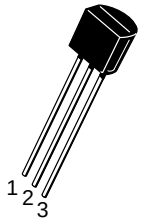
MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain−Source Voltage	V_{DS}	60	Vdc
Gate−Source Voltage − Continuous − Non−repetitive ($t_p \le 50$ μs)	 V_{GS} V_{GSM}	 ±20 ±40	 Vdc Vpk
Drain Current (Note)	I_D	0.5	Adc
Total Device Dissipation @ T_A = 25°C	P_D	350	mW
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−55 to +150	°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.

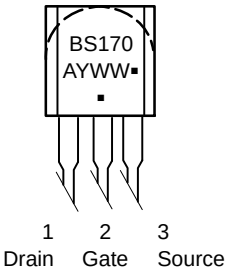
NOTE: The Power Dissipation of the package may result in a lower continuous drain current.

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



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.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Gate Reverse Current (V_{GS} = 15 Vdc, V_{DS} = 0)	I_{GSS}	–	0.01	10	nAdc
Drain−Source Breakdown Voltage (V_{GS} = 0, I_D = 100 μAdc)	$V_{(BR)DSS}$	60	90	–	Vdc
ON CHARACTERISTICS (Note 1)					
Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = 1.0 mAdc)	$V_{GS(Th)}$	0.8	2.0	3.0	Vdc
Static Drain−Source On Resistance (V_{GS} = 10 Vdc, I_D = 200 mAdc)	$r_{DS(on)}$	–	1.8	5.0	Ω
Drain Cutoff Current (V_{DS} = 25 Vdc, V_{GS} = 0 Vdc)	$I_{D(off)}$	–	–	0.5	μA
Forward Transconductance (V_{DS} = 10 Vdc, I_D = 250 mAdc)	g_{fs}	–	200	–	mmhos
SMALL−SIGNAL CHARACTERISTICS					
Input Capacitance (V_{DS} = 10 Vdc, V_{GS} = 0, f = 1.0 MHz)	C_{iss}	–	–	60	pF
SWITCHING CHARACTERISTICS					
Turn−On Time (I_D = 0.2 Adc) See Figure 1	t_{on}	–	4.0	10	ns
Turn−Off Time (I_D = 0.2 Adc) See Figure 1	t_{off}	–	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†
BS170	TO−92 (TO−226) (Pb−Free)	1000 Unit/Tube
BS170RLRAG	TO−92 (TO−226) (Pb−Free)	2000 Tape & Reel

†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

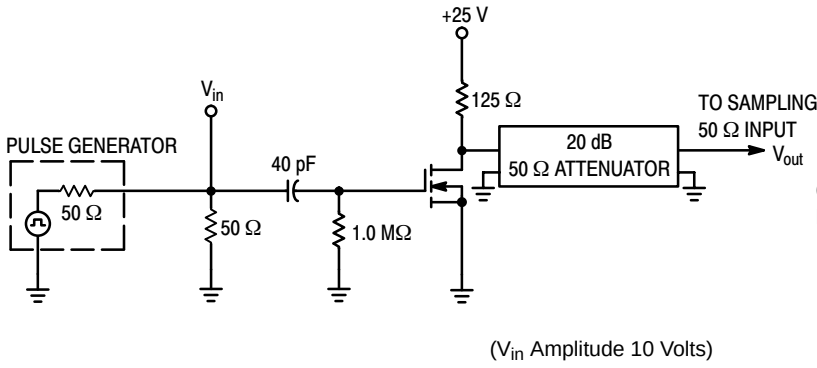


Figure 1. Switching Test Circuit

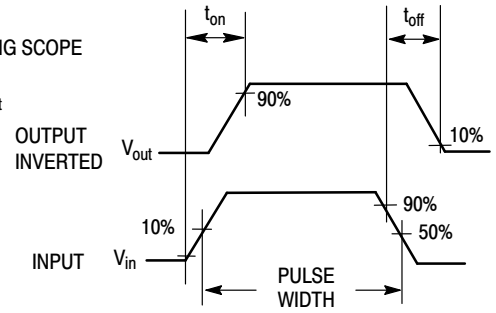


Figure 2. Switching Waveforms

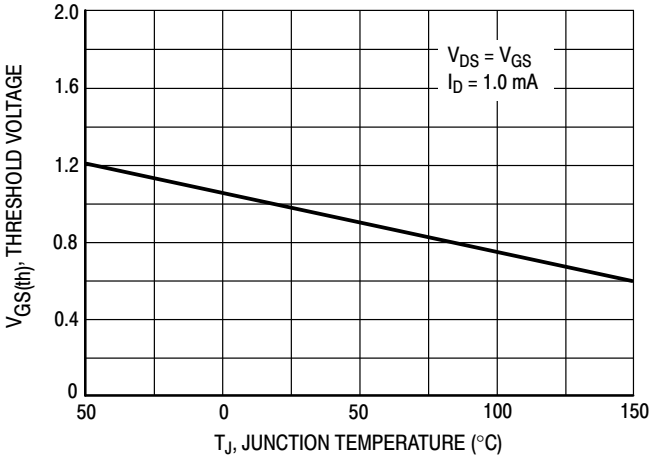


Figure 3. $V_{GS(th)}$ Normalized versus Temperature

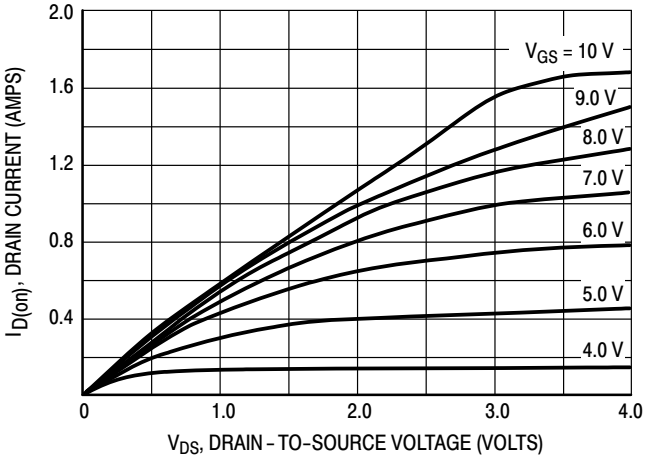


Figure 4. On−Region Characteristics

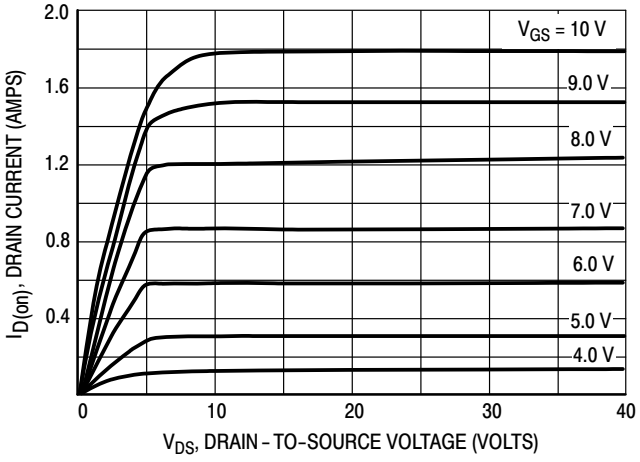


Figure 5. Output Characteristics

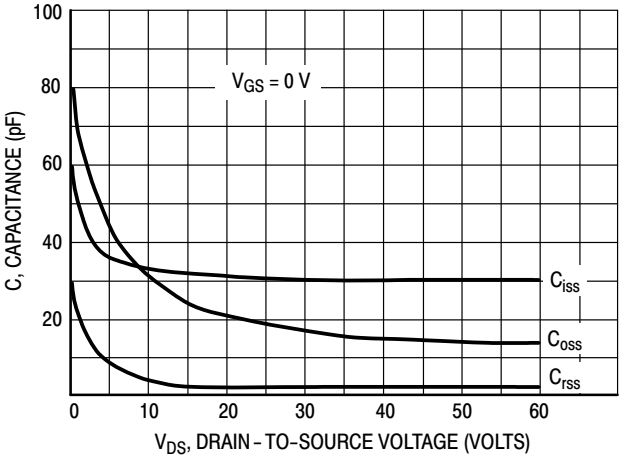


Figure 6. Capacitance versus Drain−To−Source Voltage

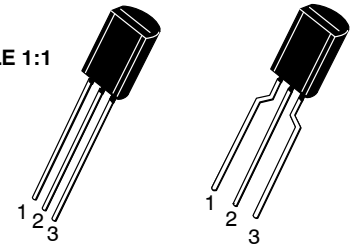
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

ON Semiconductor®

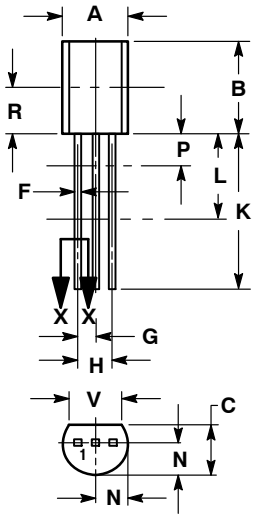
TO−92 (TO−226) 1 WATT
CASE 29−10
ISSUE A

DATE 08 MAY 2012

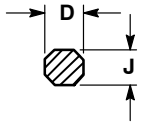
SCALE 1:1



STRAIGHT LEAD BENT LEAD



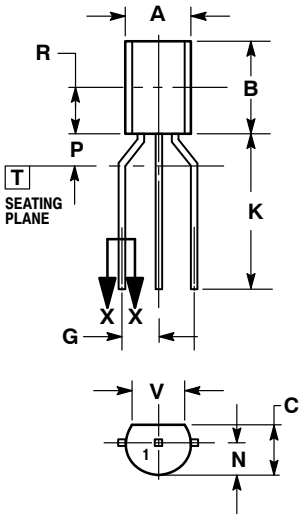
STRAIGHT LEAD



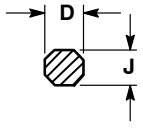
SECTION X−X

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.

	INCHES		MILLIMETERS	
DIM	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.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
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	INCHES		MILLIMETERS	
DIM	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
G	0.094	0.102	2.40	2.80
J	0.018	0.024	0.46	0.61
K	0.500	---	12.70	---
N	0.080	0.105	2.04	2.66
P	---	0.100	---	2.54
R	0.135	---	3.43	---
V	0.135	---	3.43	---

STYLES ON PAGE 2

DOCUMENT NUMBER:	**98AON52857E**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	**TO−92 (TO−226) 1 WATT**	**PAGE 1 OF 2**

TO−92 (TO−226) 1 WATT
CASE 29−10
ISSUE A

DATE 08 MAY 2012

STYLE 1:
PIN 1. EMITTER
2. BASE
3. COLLECTOR

STYLE 2:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

STYLE 3:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 4:
PIN 1. CATHODE
2. CATHODE
3. ANODE

STYLE 5:
PIN 1. DRAIN
2. SOURCE
3. GATE

STYLE 6:
PIN 1. GATE
2. SOURCE & SUBSTRATE
3. DRAIN

STYLE 7:
PIN 1. SOURCE
2. DRAIN
3. GATE

STYLE 8:
PIN 1. DRAIN
2. GATE
3. SOURCE & SUBSTRATE

STYLE 9:
PIN 1. BASE 1
2. EMITTER
3. BASE 2

STYLE 10:
PIN 1. CATHODE
2. GATE
3. ANODE

STYLE 11:
PIN 1. ANODE
2. CATHODE & ANODE
3. CATHODE

STYLE 12:
PIN 1. MAIN TERMINAL 1
2. GATE
3. MAIN TERMINAL 2

STYLE 13:
PIN 1. ANODE 1
2. GATE
3. CATHODE 2

STYLE 14:
PIN 1. EMITTER
2. COLLECTOR
3. BASE

STYLE 15:
PIN 1. ANODE 1
2. CATHODE
3. ANODE 2

STYLE 16:
PIN 1. ANODE
2. GATE
3. CATHODE

STYLE 17:
PIN 1. COLLECTOR
2. BASE
3. EMITTER

STYLE 18:
PIN 1. ANODE
2. CATHODE
3. NOT CONNECTED

STYLE 19:
PIN 1. GATE
2. ANODE
3. CATHODE

STYLE 20:
PIN 1. NOT CONNECTED
2. CATHODE
3. ANODE

STYLE 21:
PIN 1. COLLECTOR
2. EMITTER
3. BASE

STYLE 22:
PIN 1. SOURCE
2. GATE
3. DRAIN

STYLE 23:
PIN 1. GATE
2. SOURCE
3. DRAIN

STYLE 24:
PIN 1. EMITTER
2. COLLECTOR/ANODE
3. CATHODE

STYLE 25:
PIN 1. MT 1
2. GATE
3. MT 2

STYLE 26:
PIN 1. V_{CC}
2. GROUND 2
3. OUTPUT

STYLE 27:
PIN 1. MT
2. SUBSTRATE
3. MT

STYLE 28:
PIN 1. CATHODE
2. ANODE
3. GATE

STYLE 29:
PIN 1. NOT CONNECTED
2. ANODE
3. CATHODE

STYLE 30:
PIN 1. DRAIN
2. GATE
3. SOURCE

STYLE 31:
PIN 1. GATE
2. DRAIN
3. SOURCE

STYLE 32:
PIN 1. BASE
2. COLLECTOR
3. EMITTER

STYLE 33:
PIN 1. RETURN
2. INPUT
3. OUTPUT

STYLE 34:
PIN 1. INPUT
2. GROUND
3. LOGIC

STYLE 35:
PIN 1. GATE
2. COLLECTOR
3. EMITTER

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