

81C 00093

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T-27-19

LOW NOISE NPN SMALL SIGNAL TRANSISTOR

2N1711

The transistor is a silicon planar epitaxial npn device conforming to JEDEC TO-39, BS SO-134A and IEC C4/B4C outlines.

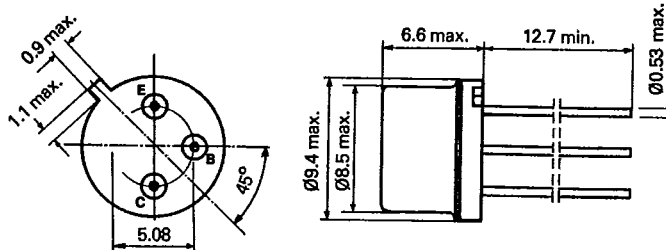
It is designed for use in high performance amplifier, oscillator and switching circuits where low noise is an important factor.

### QUICK REFERENCE DATA

$V_{CB0max.}$	75V
$V_{CERmax.}$ ( $R_{BE} = 10\Omega$ )	50V
$V_{CE(sat)max.}$ at $I_C = 150\text{ mA}$ , $I_B = 15\text{ mA}$ and $T_{amb} = 25^\circ\text{C}$	1.5V
$I_{Cmax.}$	500mA
$h_{FEmin.}$ at $V_{CE} = 10\text{V}$ , $I_C = 150\text{ mA}$ and $T_{amb} = 25^\circ\text{C}$	100
$P_{totmax.}$ at $T_{amb} = 25^\circ\text{C}$	0.8W

### Outline and Dimensions

JEDEC TO-39  
BS SO-134A  
IEC C4/B4C



All dimensions in millimetres  
For detail dimensions see Page 4

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In the interest of improved product design, changes to this specification may be made at any time.



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## RATINGS

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The ratings quoted are limiting values of operating and environmental conditions and are in accordance with the absolute maximum rating system defined in BS 3494 (Part 1) and IEC Publication 134.

## Voltage Ratings

V <sub>CBO</sub>	Collector-base voltage at I <sub>E</sub> = 0	75V
V <sub>CER</sub>	Collector-emitter voltage (R <sub>BE</sub> = 10Ω)	50V
V <sub>EBO</sub>	Emitter-base voltage at I <sub>C</sub> = 0	7V

## Current Rating

I <sub>C</sub>	Collector current (continuous)	500mA
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## Power Ratings

P <sub>tot</sub>	Total power dissipation	
	T <sub>amb</sub> = 25°C	0.8W
	T <sub>case</sub> = 25°C	3W
	T <sub>case</sub> = 100°C	1.7W

## Thermal Ratings

T <sub>j</sub>	Operating junction temperature range	-65°C to +200°C
T <sub>stg</sub>	Storage temperature range	-65°C to +200°C

## CHARACTERISTICS

## Electrical Characteristics

	Min.	Typ.	Max.
I <sub>CBO</sub>	Collector-base cut-off current V <sub>CB</sub> = 60V, I <sub>E</sub> = 0 and T <sub>amb</sub> = 25°C V <sub>CB</sub> = 60V, I <sub>E</sub> = 0 and T <sub>amb</sub> = 150°C	0.3nA 0.4μA	10nA 10μA
I <sub>EBO</sub>	Emitter-base cut-off current at V <sub>EB</sub> = 5V, I <sub>C</sub> = 0 and T <sub>amb</sub> = 25°C	0.05nA	5nA
V <sub>CBO</sub>	Collector-base voltage at I <sub>C</sub> = 0.1mA, I <sub>E</sub> = 0 and T <sub>case</sub> = 25°C	75V	
V <sub>CER(sus)</sub>	*Collector-emitter sustaining voltage at I <sub>C</sub> = 10mA, R <sub>BE</sub> = 10Ω and T <sub>amb</sub> = 25°C	50V	
V <sub>EBO</sub>	Emitter-base voltage at I <sub>C</sub> = 0, I <sub>E</sub> = 0.1mA and T <sub>amb</sub> = 25°C	7V	
V <sub>BE(sat)</sub>	*Base-emitter saturation voltage at I <sub>C</sub> = 150mA, I <sub>B</sub> = 15mA and T <sub>amb</sub> = 25°C	0.95V	1.3V
V <sub>CE(sat)</sub>	*Collector-emitter saturation voltage at I <sub>C</sub> = 150mA, I <sub>B</sub> = 15mA and T <sub>amb</sub> = 25°C	0.5V	1.5V
h <sub>FE</sub>	Static value of common emitter forward current transfer ratio V <sub>CE</sub> = 10V, I <sub>C</sub> = 0.01mA and T <sub>amb</sub> = 25°C V <sub>CE</sub> = 10V, I <sub>C</sub> = 0.1mA and T <sub>amb</sub> = 25°C V <sub>CE</sub> = 10V, I <sub>C</sub> = 10mA* and T <sub>amb</sub> = 25°C V <sub>CE</sub> = 10V, I <sub>C</sub> = 150mA* and T <sub>amb</sub> = 25°C V <sub>CE</sub> = 10V, I <sub>C</sub> = 500mA* and T <sub>amb</sub> = 25°C V <sub>CE</sub> = 10V, I <sub>C</sub> = 10mA* and T <sub>amb</sub> = 55°C	20 35 75 100 40 35	60 80 130 300 75 65

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## Electrical Characteristics (continued)

		Min.	Typ.	Max.
$h_{fe}$	Small signal, common emitter forward current transfer ratio VCE = 5V, IC = 1mA, f = 1 kHz and Tamb = 25°C	50	115	200
	VCE = 10V, IC = 5mA, f = 1 kHz and Tamb = 25°C	70	135	300
$f_T$	Transition frequency at VCE = 10V, IC = 50mA, f = 20 MHz and Tamb = 25°C	70MHz	100MHz	
CEBO	Emitter-base capacitance at VEB = 0.5V, IC = 0, f = 1 MHz and Tamb = 25°C		50pF	80pF
CCBO	Collector-base capacitance at VCB = 10V, IE = 0, f = 1 MHz and Tamb = 25°C		18pF	25pF
NF	Noise figure at VCE = 10V, IC = 0.3mA, f = 1 kHz, Rg = 510Ω and Tamb = 25°C		3.5dB	8dB
$h_{ib}$	Short-circuit input impedance VCB = 5V, IC = 1mA, f = 1 kHz and Tamb = 25°C	24Ω	27Ω	34Ω
	VCB = 10V, IC = 5mA, f = 1 kHz and Tamb = 25°C	4Ω	6.3Ω	8Ω
$h_{rb}$	Open-circuit reverse voltage transfer ratio VCB = 5V, IC = 1mA, f = 1 kHz and Tamb = 25°C		$1.2 \times 10^{-4}$	$5 \times 10^{-4}$
	VCB = 10V, IC = 5mA, f = 1 kHz and Tamb = 25°C		$1.2 \times 10^{-4}$	$5 \times 10^{-4}$
$h_{ob}$	Open-circuit output admittance VCB = 5V, IC = 1mA, f = 1 kHz and Tamb = 25°C	0.1μS	0.16μS	0.5μS
	VCB = 5V, IC = 5mA, f = 1 kHz and Tamb = 25°C	0.1μS	0.19μS	1μS
$h_{ie}$	Short-circuit input impedance at VCE = 5V, IC = 1mA, f = 1 kHz and Tamb = 25°C		4.4kΩ	
$h_{re}$	Open-circuit reverse voltage transfer ratio at VCE = 5V, IC = 1mA, f = 1 kHz and Tamb = 25°C		$7.3 \times 10^{-4}$	
$h_{oe}$	Open-circuit output admittance at VCE = 5V, IC = 1 mA, f = 1 kHz and Tamb = 25°C			23.8μS

\* Pulsed;  $t_p = 300 \mu s$ ; duty cycle = 1%.

## Thermal Characteristics

	Min.	Typ.	Max.
Rth(j-case) Thermal resistance (junction to case)			58.3 deg C/W
Rth(j-amb) Thermal resistance (junction to ambient)			219 deg C/W

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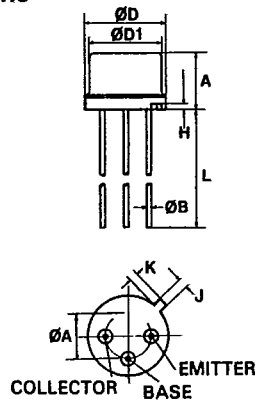
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**MECHANICAL DETAIL**  
Outline and Dimensions

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Ref.	Millimetres		Inches		Notes
	Min.	Max.	Min.	Max.	
A	6.10	6.60	0.240	0.260	
ØA	4.83	5.33	0.190	0.210	
ØB	0.41	0.53	0.016	0.021	
ØD	8.89	9.39	0.350	0.370	
ØD1	8.01	8.50	0.315	0.335	
H	0.23	1.01	0.009	0.040	
J	0.71	0.86	0.028	0.034	
K	0.74	1.02	0.029	0.040	
L	12.70	—	0.500	—	

**Notes**

1. The transistors conform to BS SO-134A, IEC C4/B4C and JEDEC TO-39 outlines.
2. The millimetre dimensions are derived from the inch dimensions.

Weight 1 gramme.

**INSTALLATION NOTES**

The emitter, base and collector leads are identified on the transistor outline.  
Note the collector is connected also to the case.

The leads must not be bent within 0.06 in (1.5mm) of the seals.

When soldering, a thermal shunt should be used to protect the transistor.

The transistor leads may be dip-soldered at a temperature of 240°C for 10 seconds up to a point 0.1 in (2.54mm) from the seals.

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