

## Excellent Integrated System Limited

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**2N1613**  
**2N1711**

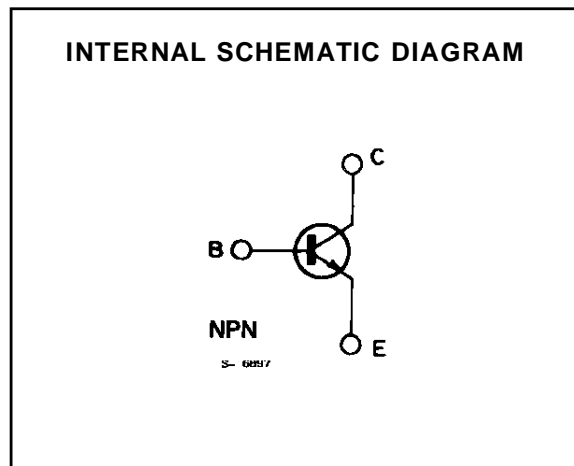
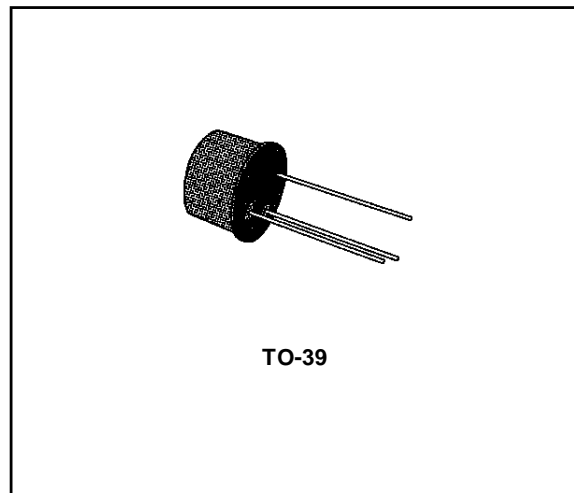
## SWITCHES AND UNIVERSAL AMPLIFIERS

### DESCRIPTION

The 2N1613 and 2N1711 are silicon planar epitaxial NPN transistors in Jedec TO-39 metal case. They are designed for use in high-performance amplifier, oscillator and switching circuits.

The 2N1711 is also used to advantage in amplifiers where low noise is an important factor.

 Products approved to CECC 50002-104 available on request.



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CBO}$	Collector-base Voltage ( $I_E = 0$ )	75	V
$V_{CER}$	Collector-emitter Voltage ( $R_{BE} \leq 10 \Omega$ )	50	V
$V_{EBO}$	Emitter-base Voltage ( $I_C = 0$ )	7	V
$I_C$	Collector Current	500	mA
$P_{tot}$	Total Power Dissipation at $T_{amb} \leq 25 \text{ }^\circ\text{C}$	0.8	W
	at $T_{case} \leq 25 \text{ }^\circ\text{C}$	3	W
	at $T_{case} \leq 100 \text{ }^\circ\text{C}$	1.7	W
$T_{stg}, T_j$	Storage and Junction Temperature	- 65 to 200	$^\circ\text{C}$

## 2N1613-2N1711

### THERMAL DATA

$R_{th\ j-case}$	Thermal Resistance Junction-case	Max	58	°C/W
$R_{th\ j-amb}$	Thermal Resistance Junction-ambient	Max	219	°C/W

### ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25\ ^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CBO}$	Collector Cutoff Current ( $I_E = 0$ )	$V_{CB} = 60\ \text{V}$ $V_{CB} = 60\ \text{V}$ $T_{amb} = 150\ ^\circ\text{C}$			10 10	nA $\mu\text{A}$
$I_{EBO}$	Emitter Cutoff Current ( $I_C = 0$ )	$V_{EB} = 5\ \text{V}$ for <b>2N1613</b> for <b>2N1711</b>			10 5	nA nA
$V_{(BR)\ CBO}$	Collector-base Breakdown Voltage	$I_C = 0.1\ \text{mA}$	75			V
$V_{(BR)\ CER}^*$	Collector-emitter Breakdown Voltage ( $R_{BE} \leq 10\ \Omega$ )	$I_C = 10\ \text{mA}$	50			V
$V_{(BR)\ EBO}$	Emitter-base Breakdown Voltage ( $I_C = 0$ )	$I_E = 0.1\ \text{mA}$	7			V
$V_{CE\ (sat)}^*$	Collector-emitter Saturation Voltage	$I_C = 150\ \text{mA}$ $I_B = 15\ \text{mA}$		0.5	1.5	V
$V_{BE\ (sat)}^*$	Base-emitter Saturation Voltage	$I_C = 150\ \text{mA}$ $I_B = 15\ \text{mA}$		0.95	1.3	V
$h_{FE}^*$	DC Current Gain	for <b>2N1613</b> $I_C = 0.01\ \text{mA}$ $V_{CE} = 10\ \text{V}$ $I_C = 0.1\ \text{mA}$ $V_{CE} = 10\ \text{V}$ $I_C = 10\ \text{mA}$ $V_{CE} = 10\ \text{V}$ $I_C = 150\ \text{mA}$ $V_{CE} = 10\ \text{V}$ $I_C = 500\ \text{mA}$ $V_{CE} = 10\ \text{V}$ $I_C = 10\ \text{mA}$ $V_{CE} = 10\ \text{V}$ $T_{amb} = -55\ ^\circ\text{C}$	20 35 40 20 20	35 50 80 80 55 35	120	
$h_{FE}^*$	DC Current Gain	for <b>2N1711</b> $I_C = 0.01\ \text{mA}$ $V_{CE} = 10\ \text{V}$ $I_C = 0.1\ \text{mA}$ $V_{CE} = 10\ \text{V}$ $I_C = 10\ \text{mA}$ $V_{CE} = 10\ \text{V}$ $I_C = 150\ \text{mA}$ $V_{CE} = 10\ \text{V}$ $I_C = 500\ \text{mA}$ $V_{CE} = 10\ \text{V}$ $I_C = 10\ \text{mA}$ $V_{CE} = 10\ \text{V}$ $T_{amb} = 55\ ^\circ\text{C}$	20 35	60 80 130 130 75 65	300	
$h_{fe}$	Small Signal Current Gain	for <b>2N1613</b> $I_C = 1\ \text{mA}$ $V_{CE} = 10\ \text{V}$ $f = 1\ \text{kHz}$ for <b>2N1711</b> $I_C = 1\ \text{mA}$ $V_{CE} = 10\ \text{V}$ $f = 1\ \text{kHz}$	30 70	70 135	150 300	
$f_t$	Transition Frequency	$I_C = 50\ \text{mA}$ $V_{CE} = 10\ \text{V}$ $f = 20\ \text{MHz}$ for <b>2N1613</b> for <b>2N1711</b>	60 70	80 100		MHz MHz
$C_{EBO}$	Emitter-base Capacitance	$I_C = 0$ $V_{EB} = 0.5\ \text{V}$ $f = 1\ \text{MHz}$		50	80	pF
$C_{CBO}$	Collector-base Capacitance	$I_E = 0$ $V_{CB} = 10\ \text{V}$ $f = 1\ \text{MHz}$		18	25	pF

\* Pulsed : pulse duration = 300  $\mu\text{s}$ , duty cycle = 1 %.

**2N1613-2N1711**
**ELECTRICAL CHARACTERISTICS** (continued)

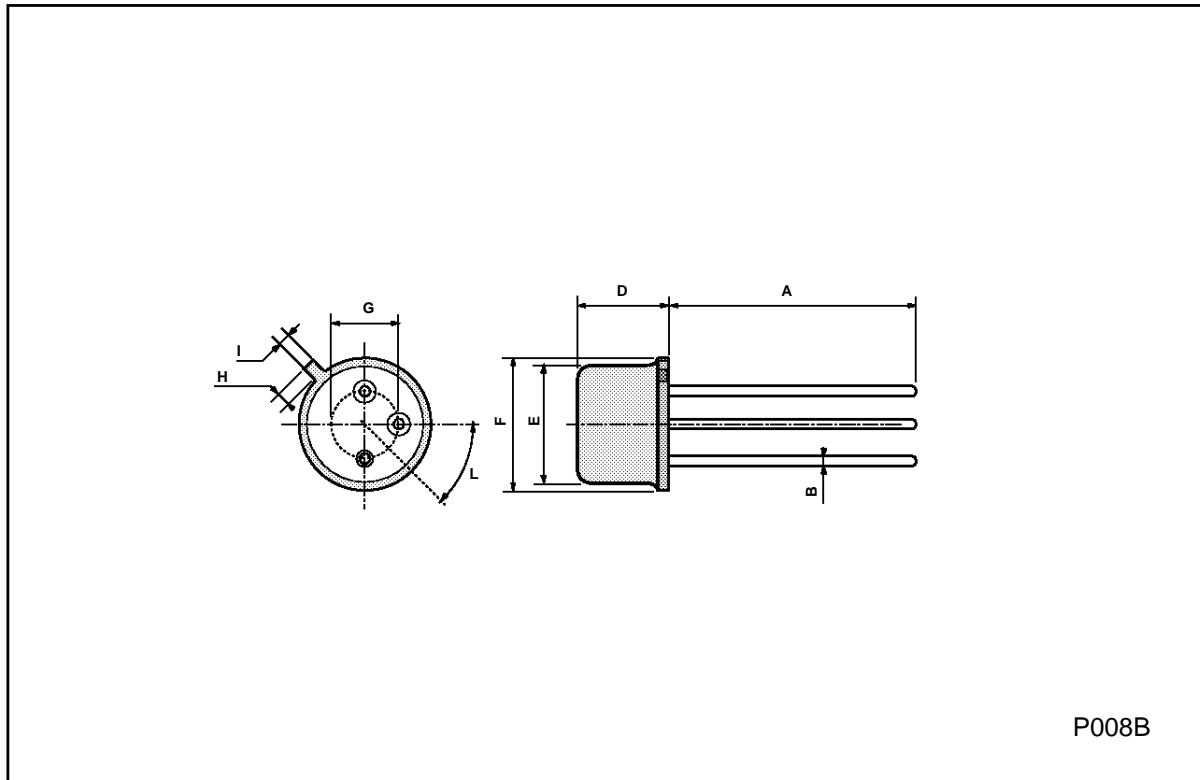
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
NF	Noise Figure	$I_C = 0.3 \text{ mA}$ $R_g = 510 \ \Omega$				
		$V_{CE} = 10 \text{ V}$ $f = 1 \text{ kHz}$ for <b>2N1613</b> for <b>2N1711</b>		6 3.5	12 8	dB dB
$h_{ie}$	Input Impedance	$I_C = 1 \text{ mA}$ $f = 1 \text{ KHz}$				
		$V_{CE} = 5 \text{ V}$ for <b>2N1613</b> for <b>2N1711</b>		2.2 4.4		k $\Omega$ k $\Omega$
$h_{re}$	Reverse Voltage Ratio	$I_C = 1 \text{ mA}$ $f = 1 \text{ kHz}$				
		$V_{CE} = 5 \text{ V}$ for <b>2N1613</b> for <b>2N1711</b>		$3.6 \times 10^{-4}$ $7.3 \times 10^{-4}$		
$h_{oe}$	Output Admittance	$I_C = 1 \text{ mA}$ $f = 1 \text{ kHz}$				
		$V_{CE} = 5 \text{ V}$ for <b>2N1613</b> for <b>2N1711</b>		12.5 23.8		$\mu\text{S}$ $\mu\text{S}$

\* Pulsed : pulse duration = 300  $\mu\text{s}$ , duty cycle = 1 %.

**2N1613-2N1711**

**TO39 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	12.7			0.500		
B			0.49			0.019
D			6.6			0.260
E			8.5			0.334
F			9.4			0.370
G	5.08			0.200		
H			1.2			0.047
I			0.9			0.035
L	45° (typ.)					



P008B

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**2N1613-2N1711**

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