


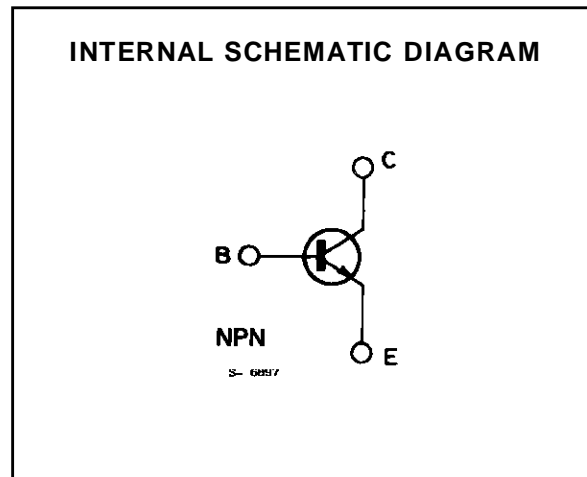
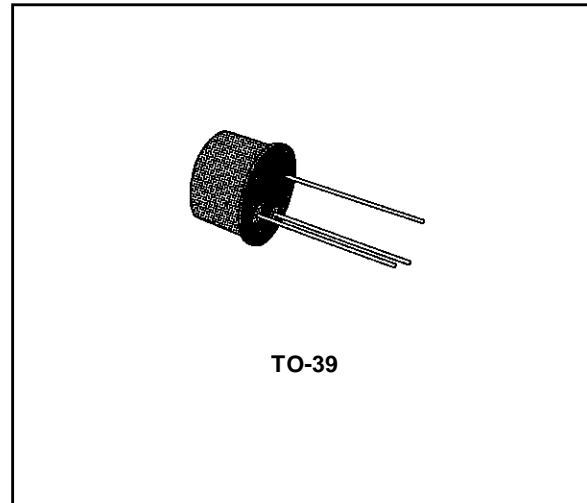
**SWITCHES AND UNIVERSAL AMPLIFIERS**

**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 ( $T_{amb} = 25\text{ °C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	
$I_{CBO}$	Collector Cutoff Current ( $I_E = 0$ )	$V_{CB} = 60\text{ V}$			10	nA	
		$V_{CB} = 60\text{ V}$ $T_{amb} = 150\text{ °C}$			10	μA	
$I_{EBO}$	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>					
		$I_C = 0.01\text{ mA}$ $V_{CE} = 10\text{ V}$		35			
		$I_C = 0.1\text{ mA}$ $V_{CE} = 10\text{ V}$	20	50			
		$I_C = 10\text{ mA}$ $V_{CE} = 10\text{ V}$	35	80			
		$I_C = 150\text{ mA}$ $V_{CE} = 10\text{ V}$	40	80	120		
		$I_C = 500\text{ mA}$ $V_{CE} = 10\text{ V}$	20	55			
		$I_C = 10\text{ mA}$ $V_{CE} = 10\text{ V}$					
		$T_{amb} = -55\text{ °C}$	20	35			
$h_{FE}^*$	DC Current Gain	for <b>2N1711</b>					
		$I_C = 0.01\text{ mA}$ $V_{CE} = 10\text{ V}$	20	60			
		$I_C = 0.1\text{ mA}$ $V_{CE} = 10\text{ V}$	35	80			
		$I_C = 10\text{ mA}$ $V_{CE} = 10\text{ V}$		130			
		$I_C = 150\text{ mA}$ $V_{CE} = 10\text{ V}$		130	300		
		$I_C = 500\text{ mA}$ $V_{CE} = 10\text{ V}$		75			
		$I_C = 10\text{ mA}$ $V_{CE} = 10\text{ V}$					
		$T_{amb} = 55\text{ °C}$		65			
$h_{fe}$	Small Signal Current Gain	for <b>2N1613</b>					
		$I_C = 1\text{ mA}$ $V_{CE} = 10\text{ V}$ $f = 1\text{ kHz}$	30	70	150		
		for <b>2N1711</b>					
		$I_C = 1\text{ mA}$ $V_{CE} = 10\text{ V}$ $f = 1\text{ kHz}$	70	135	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 μs, duty cycle = 1 %.

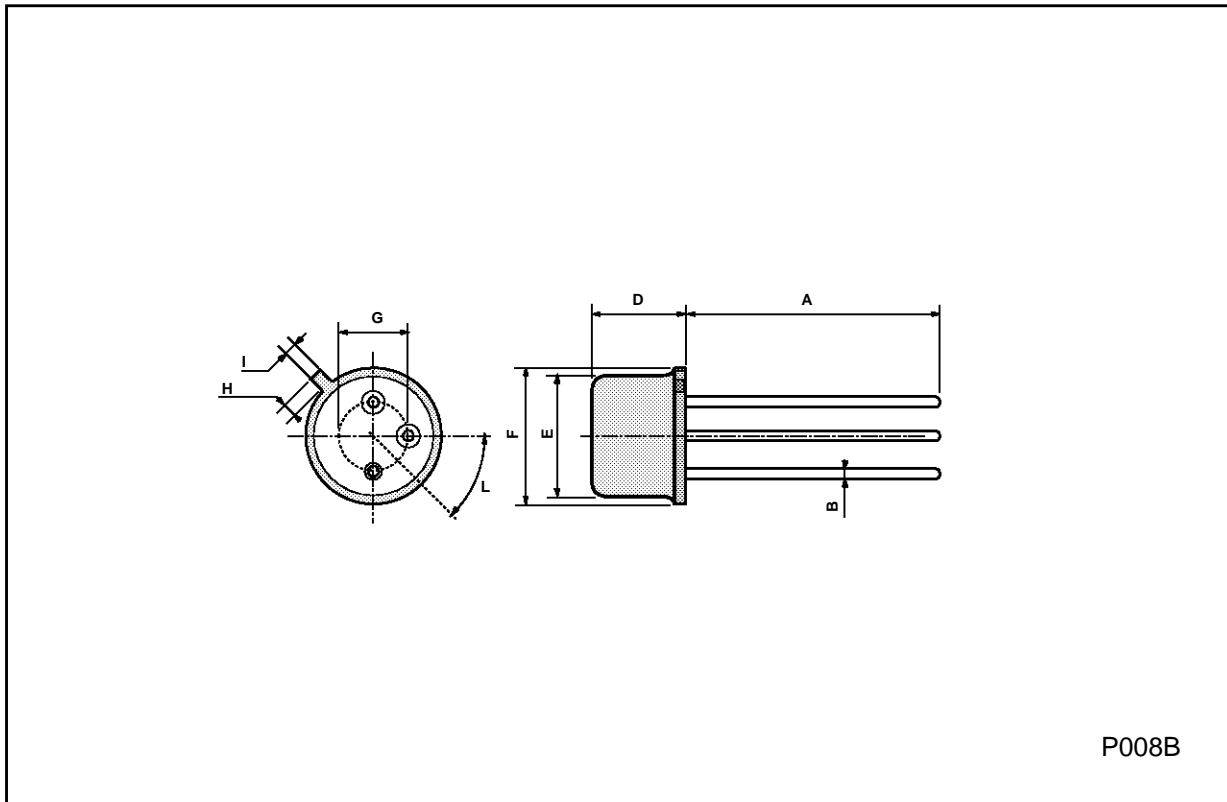
## ELECTRICAL CHARACTERISTICS (continued)

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 %.

**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.)					



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