

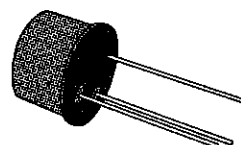
SWITCHES AND UNIVERSAL AMPLIFIERS

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.

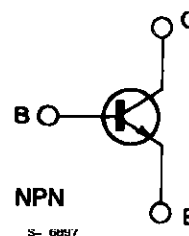
The 2N1711 is also used to advantage in amplifiers where low noise is an important factor.

 Products approved to CECC 50002-104 available on request.



TO-39

INTERNAL SCHEMATIC DIAGRAM



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 $T_{amb} \leq 25^\circ\text{C}$	0.8	W
	at $T_{case} \leq 25^\circ\text{C}$	3	W
	at $T_{case} \leq 100^\circ\text{C}$	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 ($I_E = 0$)	$V_{CB} = 60\text{ V}$ $V_{CB} = 60\text{ V}$ $T_{amb} = 150\text{ °C}$			10 10	nA μA
I_{EBO}	Emitter Cutoff Current ($I_C = 0$)	$V_{EB} = 5\text{ V}$ for 2N1613 for 2N1711			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 2N1613 $I_C = 0.01\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 0.1\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 10\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 150\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 500\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 10\text{ mA}$ $V_{CE} = 10\text{ V}$ $T_{amb} = -55\text{ °C}$	20 35 35 40 20 20	35 50 80 80 55 35	120	
h_{FE}^*	DC Current Gain	for 2N1711 $I_C = 0.01\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 0.1\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 10\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 150\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 500\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 10\text{ mA}$ $V_{CE} = 10\text{ V}$ $T_{amb} = 55\text{ °C}$	20 35	60 80 130 130 75 65	300	
h_{fe}	Small Signal Current Gain	for 2N1613 $I_C = 1\text{ mA}$ $V_{CE} = 10\text{ V}$ $f = 1\text{ kHz}$ for 2N1711 $I_C = 1\text{ mA}$ $V_{CE} = 10\text{ V}$ $f = 1\text{ kHz}$	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 2N1613 for 2N1711	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 %.

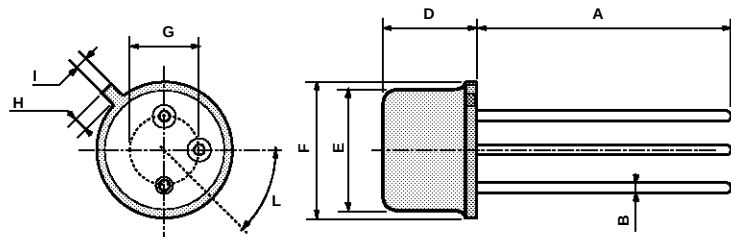
ELECTRICAL CHARACTERISTICS (continued)

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 2N1613 for 2N1711		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 2N1613 for 2N1711		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 2N1613 for 2N1711		3.6×10^{-4} 7.3×10^{-4}		
h_{oe}	Output Admittance	$I_C = 1 \text{ mA}$ $f = 1 \text{ kHz}$ $V_{CE} = 5 \text{ V}$ for 2N1613 for 2N1711		12.5 23.8		μS μS

* Pulsed : pulse duration = 300 μs , 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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