
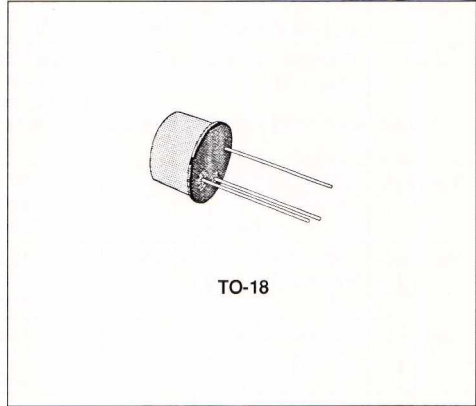


## HIGH-SPEED SATURATED SWITCHES

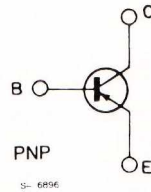
### DESCRIPTION

The 2N2894, and 2N3209 are silicon planar epitaxial PNP transistors in Jedec TO-18 metal case, intended for high speed, low saturation switching applications up to 100 mA.

 Products approved to CECC 50004-022/023 available on request.



### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		2N2894	2N3209	
$V_{CBO}$	Collector-base Voltage ( $I_E = 0$ )	- 12	- 20	V
$V_{CES}$	Collector-emitter Voltage ( $V_{BE} = 0$ )	- 12	- 20	V
$V_{CEO}$	Collector-emitter Voltage ( $I_B = 0$ )	- 12	- 20	V
$V_{EBO}$	Emitter-base Voltage ( $I_C = 0$ )	- 4		V
$I_C$	Collector Current	- 200		mA
$P_{tot}$	Total Power Dissipation at $T_{amb} \leq 25^\circ\text{C}$ at $T_{case} \leq 25^\circ\text{C}$	0.36		W
		1.2		W
$T_{stg}, T_J$	Storage and Junction Temperature	- 65 to 200		$^\circ\text{C}$

**THERMAL DATA**

R <sub>th j-case</sub>	Thermal Resistance Junction-case	Max	146	°C/W
R <sub>th j-amb</sub>	Thermal Resistance Junction-ambient	Max	486	°C/W

**ELECTRICAL CHARACTERISTICS** (T<sub>amb</sub> = 25 °C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I <sub>CB0</sub>	Collector Cutoff Current (I <sub>E</sub> = 0) (for <b>2N2894</b> only)	V <sub>CB</sub> = - 6 V T <sub>amb</sub> = 125 °C			- 10	μA
I <sub>CES</sub>	Collector Cutoff Current (V <sub>BE</sub> = 0)	for <b>2N2894</b> V <sub>CE</sub> = - 6 V for <b>2N3209</b> V <sub>CE</sub> = - 10 V V <sub>CE</sub> = - 10 V T <sub>amb</sub> = 125 °C			- 80 - 80 - 10	nA nA μA
V <sub>(BR)CBO</sub>	Collector-base Breakdown Voltage (I <sub>E</sub> = 0)	I <sub>C</sub> = - 10 μA for <b>2N2894</b> for <b>2N3209</b>	- 12 - 20			V V
V <sub>(BR)CES</sub>	Collector-emitter Breakdown Voltage (V <sub>BE</sub> = 0)	I <sub>C</sub> = - 10 μA for <b>2N2894</b> for <b>2N3209</b>	- 12 - 20			V V
V <sub>(BR)CEO*</sub>	Collector-emitter Breakdown Voltage (I <sub>B</sub> = 0)	I <sub>C</sub> = - 10 mA for <b>2N2894</b> for <b>2N3209</b>	- 12 - 20			V V
V <sub>(BR)EBO</sub>	Emittter-base Breakdown Voltage (I <sub>C</sub> = 0)	I <sub>E</sub> = - 100 μA	- 4			V
V <sub>CE(sat)*</sub>	Collector-emitter Saturation Voltage	for <b>2N2894</b> I <sub>C</sub> = - 10 mA I <sub>B</sub> = - 1 mA I <sub>C</sub> = - 30 mA I <sub>B</sub> = - 3 mA I <sub>C</sub> = - 100 mA I <sub>B</sub> = - 10 mA for <b>2N3209</b> I <sub>C</sub> = - 10 mA I <sub>B</sub> = - 1 mA I <sub>C</sub> = - 30 mA I <sub>B</sub> = - 3 mA I <sub>C</sub> = - 100 mA I <sub>B</sub> = - 10 mA			- 0.15 - 0.2 - 0.5 - 0.15 - 0.2 - 0.6	V V V V V V
V <sub>BE(sat)*</sub>	Base-emitter Saturation Voltage	I <sub>C</sub> = - 10 mA I <sub>B</sub> = - 1 mA I <sub>C</sub> = - 30 mA I <sub>B</sub> = - 3 mA I <sub>C</sub> = - 100 mA I <sub>B</sub> = - 10 mA	- 0.78 - 0.85		- 0.98 - 1.2 - 1.7	V V V
h <sub>FE*</sub>	DC Current Gain	I <sub>C</sub> = - 10 mA V <sub>CE</sub> = - 0.3 V for <b>2N2894</b> for <b>2N3209</b> I <sub>C</sub> = - 30 mA V <sub>CE</sub> = - 0.5 V for <b>2N2894</b> for <b>2N3209</b> I <sub>C</sub> = - 100 mA V <sub>CE</sub> = - 1 V for <b>2N2894</b> for <b>2N3209</b> I <sub>C</sub> = - 30 mA V <sub>CE</sub> = - 0.5 V T <sub>amb</sub> = - 55 °C for <b>2N2894</b> for <b>2N3209</b>	30 25 40 30 25 15 17 12		150 120	
f <sub>T</sub>	Transition Frequency	I <sub>C</sub> = - 30 mA V <sub>CE</sub> = - 10 V f = 100 MHz	400			MHz
C <sub>EBO</sub>	Emitter-base Capacitance	I <sub>C</sub> = 0 V <sub>EB</sub> = - 0.5 V f = 1 MHz			6	pF

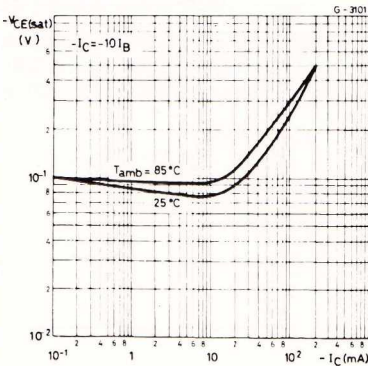
\* Pulsed : pulse duration = 300 μs, duty cycle = 1 %.

ELECTRICAL CHARACTERISTICS (continued)

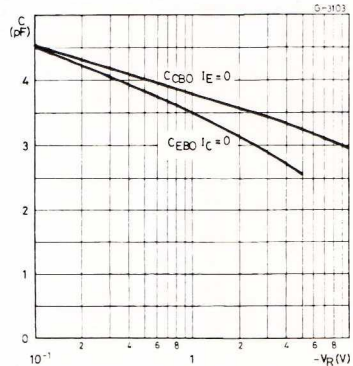
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$C_{CBO}$	Collector-base Capacitance	$I_E = 0$ $f = 1 \text{ MHz}$ for <b>2N2894</b> for <b>2N3209</b> $V_{CB} = -5 \text{ V}$			6 5	pF pF
$t_{on}^{**}$	Turn-on Time	$I_C = -30 \text{ mA}$ $I_{B1} = -1.5 \text{ mA}$ $V_{CC} = -2 \text{ V}$			60	ns
$t_{off}^{**}$	Turn-off Time	$I_C = -30 \text{ mA}$ $I_{B1} = -I_{B2} = -1.5 \text{ mA}$ $V_{CC} = -2 \text{ V}$			90	ns

\*\* See test circuit.

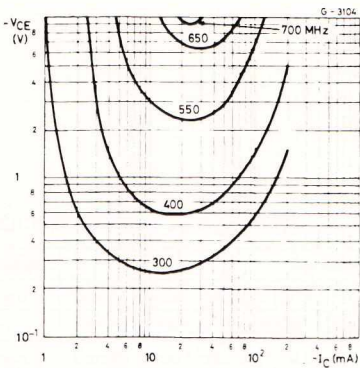
Collector-emitter Saturation Voltage.



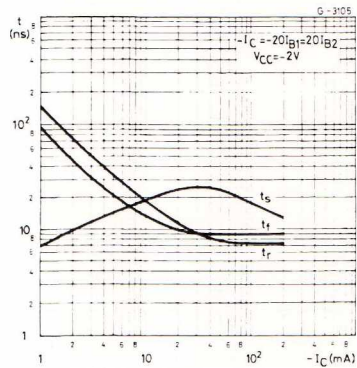
Emitter-base and Collector-base capacitance.



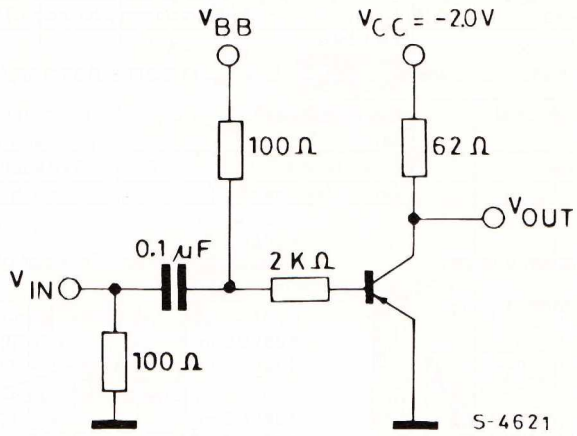
Contours of Constant Transition Frequency.



Switching Characteristics.



Test Circuit for  $t_{on}$ ,  $t_{off}$ .



PULSE GENERATOR :

$t_r \leq 1.0\ ns$   
 DC < 2 %  
 PW = 400 ns  
 $Z_{IN} = 50\ \Omega$   
 $t_{on}\ V_{BB} = +3.0\ V, V_{IN} = -7.0\ V$   
 $t_{off}\ V_{BB} = -4\ V, V_{IN} = +6\ V$

TO OSCILLOSCOPE :

$t_r < 1.0\ ns$   
 $Z_{IN} \geq 100\ k\Omega$