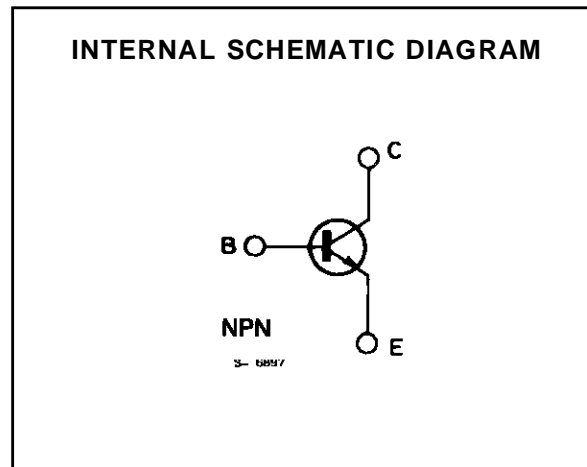
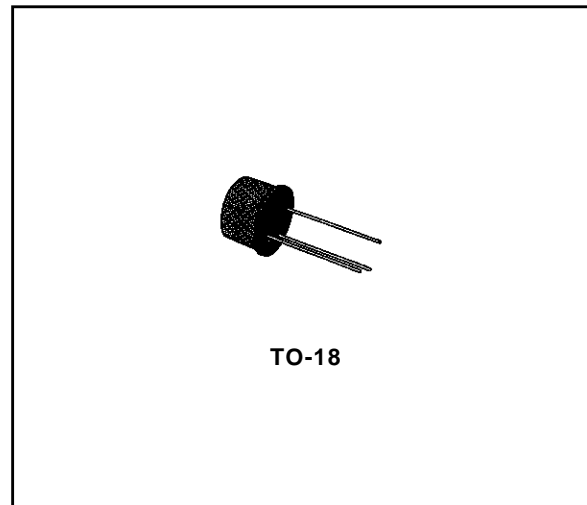


**HIGH-VOLTAGE, HIGH CURRENT SWITCH**

**DESCRIPTION**

The 2N4014 is a silicon planar epitaxial transistor in TO-18 metal case. It is a high-voltage, high current switch used for memory applications requiring breakdown voltages up to 50 V and operating currents to 1 A. Fast switching times are assured because of the high minimum  $f_T$  (300 MHz) and tight control on storage time.



**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
$V_{CBO}$	Collector-base Voltage ( $I_E = 0$ )	80	V
$V_{CES}$	Collector-emitter Voltage ( $V_{BE} = 0$ )	80	V
$V_{CEO}$	Collector-emitter Voltage ( $I_B = 0$ )	50	V
$V_{EBO}$	Emitter-base Voltage ( $I_C = 0$ )	6	V
$I_C$	Collector Current	1	A
$P_{tot}$	Total Power Dissipation at $T_{amb} \leq 25\text{ }^\circ\text{C}$ at $T_{case} \leq 25\text{ }^\circ\text{C}$	0.36	W
		1.2	W
$T_{stg}, T_j$	Storage and Junction Temperature	- 65 to 200	$^\circ\text{C}$

## THERMAL DATA

$R_{th\ j-case}$	Thermal Resistance Junction-case	Max	146	$^{\circ}C/W$
$R_{th\ j-amb}$	Thermal Resistance Junction-ambient	Max	486	$^{\circ}C/W$

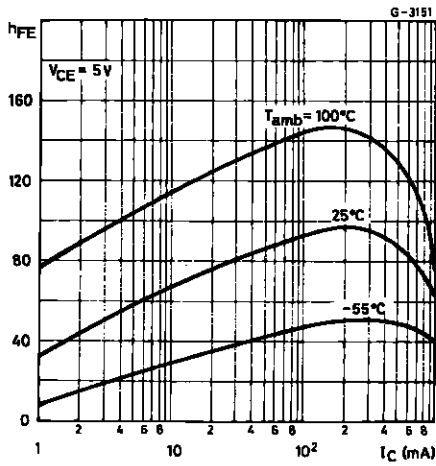
ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25\ ^{\circ}C$  unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CBO}$	Collector Cutoff Current ( $I_E = 0$ )	$V_{CB} = 60\ V$ $V_{CB} = 60\ V$ $T_{amb} = 100\ ^{\circ}C$			1.7 120	$\mu A$ $\mu A$
$V_{(BR)CBO}$	Collector-base Breakdown Voltage ( $I_E = 0$ )	$I_C = 10\ \mu A$	80			V
$V_{(BR)CES}$	Collector-emitter Breakdown Voltage ( $V_{BE} = 0$ )	$I_C = 10\ \mu A$	80			V
$V_{(BR)CEO}^*$	Collector-Emitter Breakdown Voltage ( $I_B = 0$ )	$I_C = 10\ mA$	50			V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage ( $I_C = 0$ )	$I_E = 10\ \mu A$	6			V
$V_{CE(sat)}^*$	Collector-Emitter Saturation Voltage	$I_C = 10\ mA$ $I_B = 1\ mA$ $I_C = 100\ mA$ $I_B = 10\ mA$ $I_C = 300\ mA$ $I_B = 30\ mA$ $I_C = 500\ mA$ $I_B = 50\ mA$ $I_C = 800\ mA$ $I_B = 80\ mA$ $I_C = 1000\ mA$ $I_B = 100\ mA$		0.19 0.21 0.31 0.4 0.5 0.6	0.25 0.26 0.4 0.52 0.8 0.95	V V V V V V
$V_{BE(sat)}^*$	Base-Emitter Saturation Voltage	$I_C = 10\ mA$ $I_B = 1\ mA$ $I_C = 100\ mA$ $I_B = 10\ mA$ $I_C = 300\ mA$ $I_B = 30\ mA$ $I_C = 500\ mA$ $I_B = 50\ mA$ $I_C = 800\ mA$ $I_B = 80\ mA$ $I_C = 1000\ mA$ $I_B = 100\ mA$	0.9	0.64 0.75 0.89 1.0 1.1	0.76 0.86 1.1 1.2 1.5 1.7	V V V V V V
$h_{FE}^*$	DC Current Gain	$I_C = 10\ mA$ $V_{CE} = 1\ V$ $I_C = 100\ mA$ $V_{CE} = 1\ V$ $I_C = 300\ mA$ $V_{CE} = 1\ V$ $I_C = 1000\ mA$ $V_{CE} = 5\ V$ $I_C = 800\ mA$ $V_{CE} = 2\ V$ $I_C = 500\ mA$ $V_{CE} = 1\ V$	30 60 40 25 20 35	60 90 60 65 40	150	
$h_{fe}$	High Frequency Current Gain	$I_C = 50\ mA$ $V_{CE} = 10\ V$ $f = 100\ MHz$	3			
$C_{CBO}$	Collector-base Capacitance	$I_E = 0$ $V_{CB} = 10\ V$ $f = 1\ MHz$			10	pF
$C_{EBO}$	Emitter-base Capacitance	$I_C = 0$ $V_{EB} = 0.5\ V$ $f = 1\ MHz$			55	pF
$t_{on}^{**}$	Turn-on Time	$I_C = 500\ mA$ $I_B = 50\ mA$ $V_{CC} = 30\ V$			35	ns
$t_{off}^{**}$	Turn-off Time	$I_C = 500\ mA$ $V_{CC} = 30\ V$ $I_{B1} = -I_{B2} = 50\ mA$			60	ns

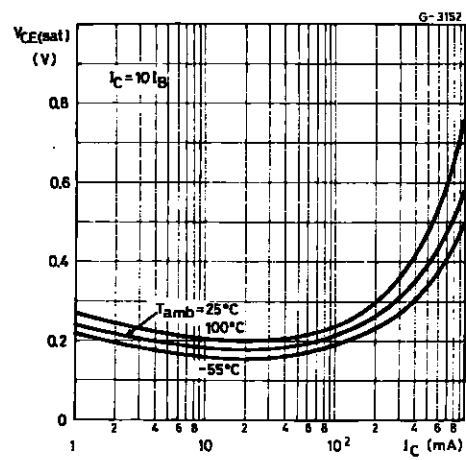
\* Pulsed : pulse duration = 300 ms, duty cycle = 1 %.

\*\* See test circuit.

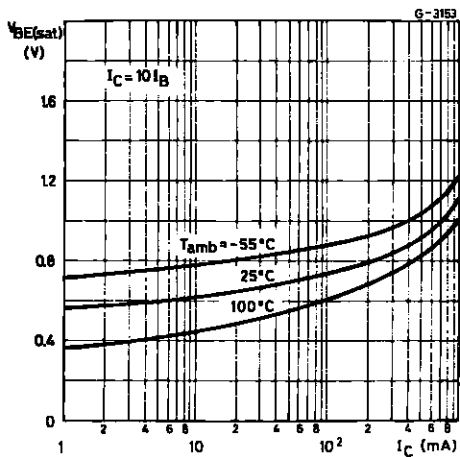
DC Current Gain.



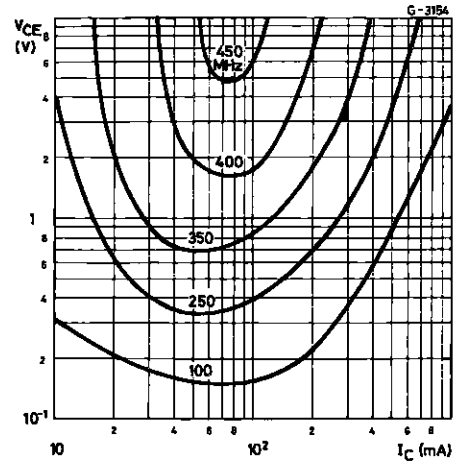
Collector-emitter Saturation Voltage.



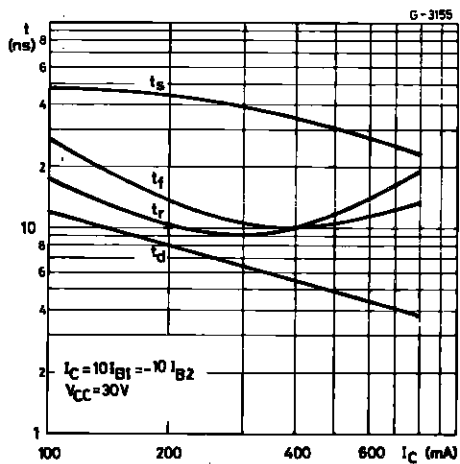
Base-emitter Saturation Voltage.



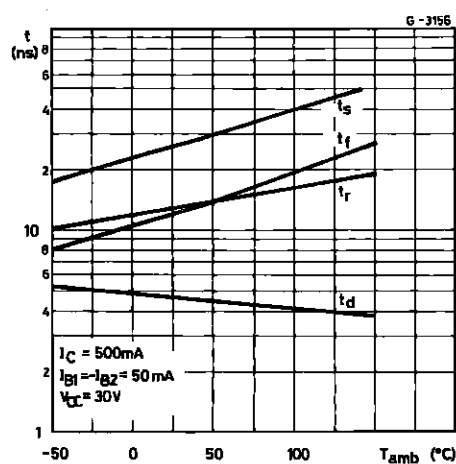
Contours of Constant Transition Frequency.



Switching Characteristics.

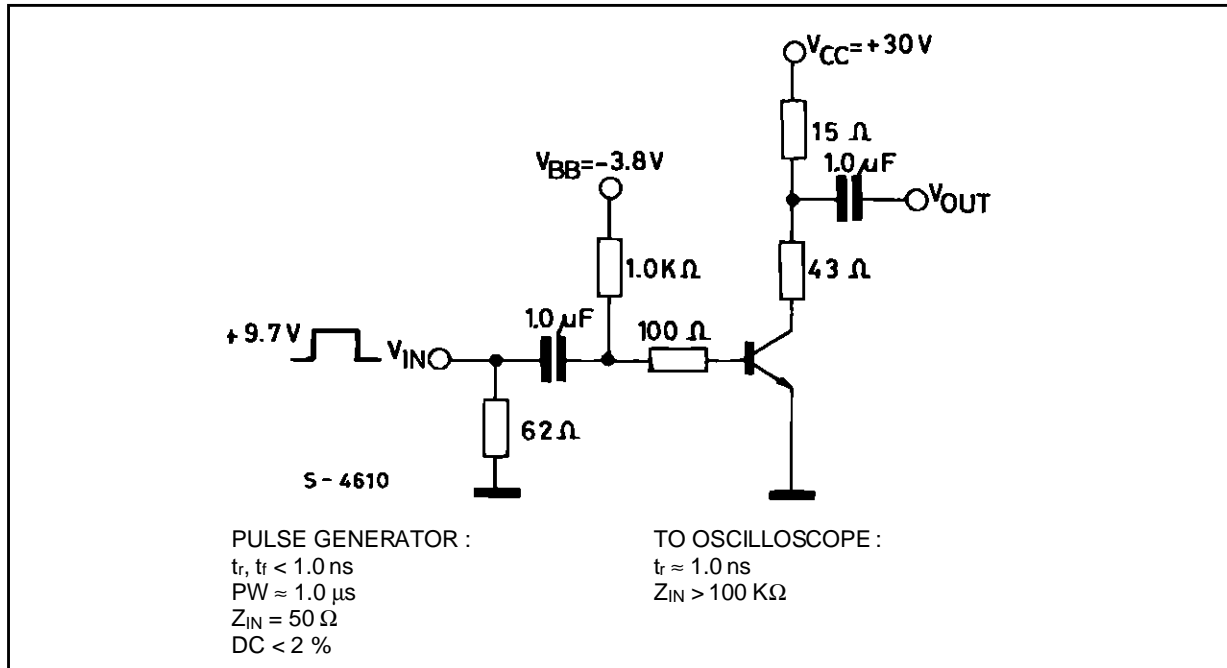


Switching Characteristics.



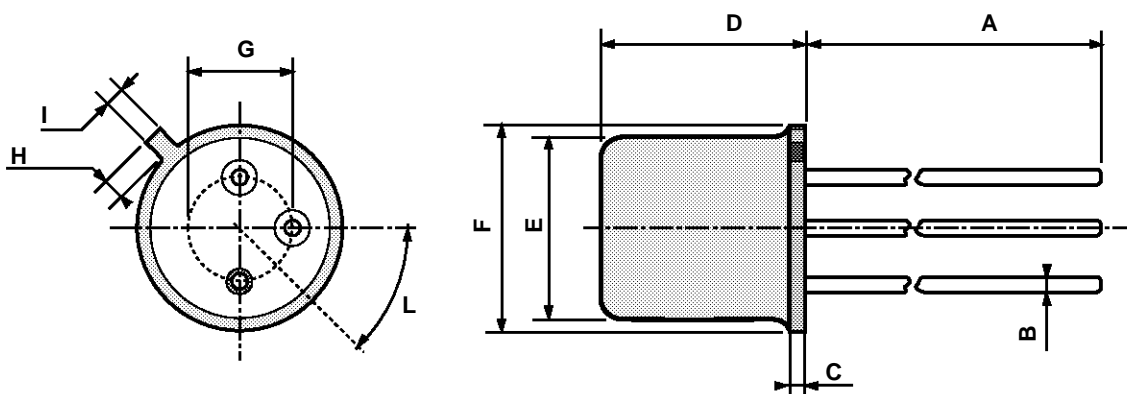
## 2N4014

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



## TO-18 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A		12.7			0.500	
B			0.49			0.019
D			5.3			0.208
E			4.9			0.193
F			5.8			0.228
G	2.54			0.100		
H			1.2			0.047
I			1.16			0.045
L	45°			45°		



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