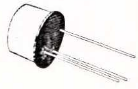
SGS-THOMSON
MICROELECTRONICS

2N4014

HIGH-VOLTAGE, HIGH CURRENT SWITCH

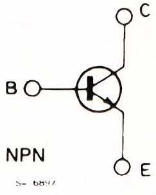
DESCRIPTION

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 fT (300 MHz) and tight control on storage time.



TO-18

INTERNAL SCHEMATIC DIAGRAM



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 $T_{amb} \leq 25$ °C at $T_{case} \leq 25$ °C	0.36 1.2	W W
T_{stg}, T_j	Storage and Junction Temperature	– 65 to 200	°C

THERMAL DATA

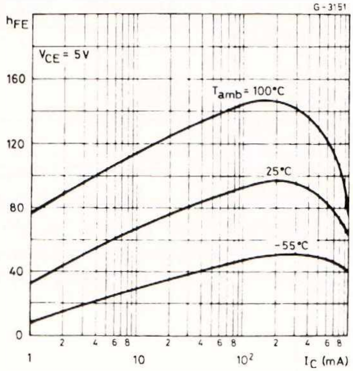
$R_{th\ j\text{-}case}$	Thermal Resistance Junction-case	Max	146	°C/W
$R_{th\ j\text{-}amb}$	Thermal Resistance Junction-ambient	Max	486	°C/W

ELECTRICAL CHARACTERISITCS(T_{amb} = 25 °C unless otherwise specified)

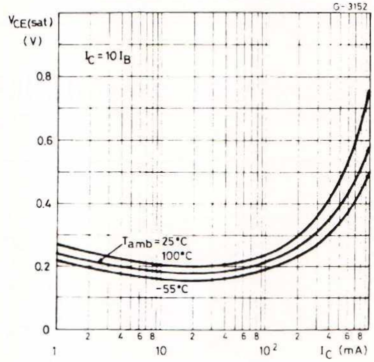
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector Cutoff Current (I_E = 0)	V_{CB} = 60 V V_{CB} = 60 V T_{amb} = 100 °C			1.7 120	µA µA
$V_{(BR)CBO}$	Collector-base Breakdown Voltage (I_E = 0)	I_C = 10 µA	80			V
$V_{(BR)CES}$	Collector-emitter Breakdown Voltage (V_{BE} = 0)	I_C =10 µA	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 µA	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.

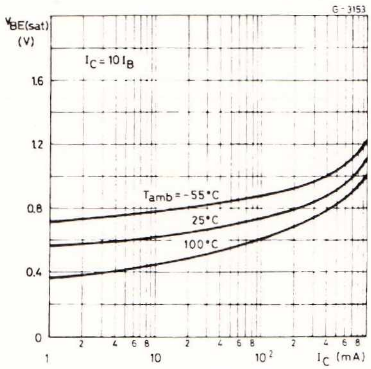
DC Current Gain.



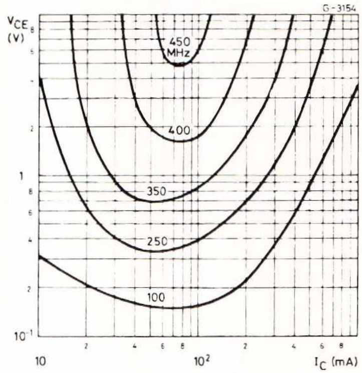
Collector-emitter Saturation Voltage.



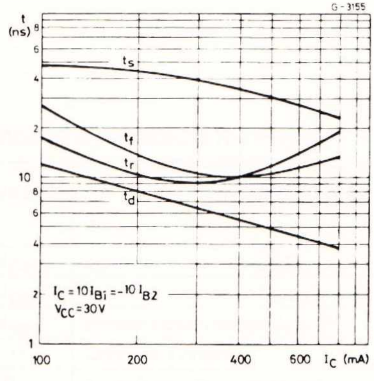
Base-emitter Saturation Voltage.



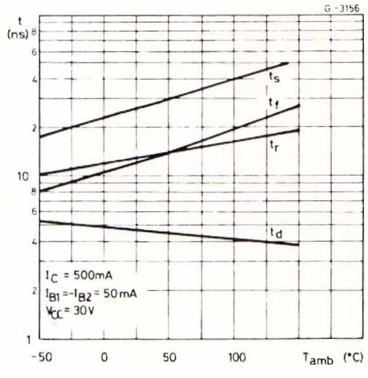
Contours of Constant Transition Frequency.



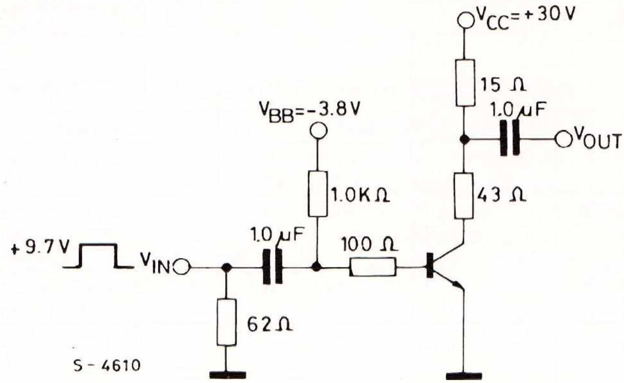
Switching Characteristics.



Switching Characteristics.



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



PULSE GENERATOR :
t_r, t_f < 1.0 ns
PW ≈ 1.0 μs
Z_{IN} = 50 Ω
DC < 2 %

TO OSCILLOSCOPE :
t_r ≈ 1.0 ns
Z_{IN} > 100 KΩ