MOTOROLA

2N3546 (SILICON)

CASE 22
(TO-18)

PNP silicon annular transistor for low-level, high-speed switching applications.

Collector connected to case

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Base Voltage	V_{CB}	15	Vdc
Collector-Emitter Voltage	V_{CEO}	12	Vdc
Emitter-Base Voltage	V_{EB}	4.5	Vdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	0.36 2.06	Watt mW/°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	1.2 6.9	Watts mW/°C
Operating Junction Temperature	T_J	200	°C
Storage Temperature Range	T_{stg}	-65 to +200	°C
Thermal Resistance, Junction to Ambient	θ_{JA}	0.49	°C/mW
Thermal Resistance, Junction to Case	θ_{JC}	0.15	°C/mW

2N3546 (continued)

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
Collector Cutoff Current (V_{CB} = 10 Vdc) (V_{CB} = 10 Vdc, T_A = 150°C)		I_{CBO}	-- --	0.010 10	μAdc
Collector Cutoff Current (V_{CE} = 10 Vdc, $V_{BE(off)}$ = 3 Vdc)		I_{CEX}	--	0.010	μAdc
Base Cutoff Current (V_{CE} = 10 Vdc, $V_{BE(off)}$ = 3 Vdc)		I_{BL}	--	0.10	μAdc
Collector-Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)		BV_{CBO}	15	--	Vdc
Emitter-Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)		BV_{EBO}	4.5	--	Vdc
Collector-Emitter Breakdown Voltage* (I_C = 10 mAdc, I_B = 0)		BV_{CEO}*	12	--	Vdc
Collector Saturation Voltage* (I_C = 10 mAdc, I_B = 1 mAdc) (I_C = 50 mAdc, I_B = 5 mAdc) (I_C = 100 mAdc, I_B = 10 mAdc)		$V_{CE(sat)}$*	-- -- --	0.15 0.25 0.50	Vdc
Base-Emitter Saturation Voltage* (I_C = 10 mAdc, I_B = 1 mAdc) (I_C = 50 mAdc, I_B = 5 mAdc) (I_C = 100 mAdc, I_B = 10 mAdc)		$V_{BE(sat)}$*	0.7 0.8 --	0.9 1.3 1.6	Vdc
DC Current Gain* (I_C = 1.0 mAdc, V_{CE} = 1 Vdc) (I_C = 10 mAdc, V_{CE} = 1 Vdc) (I_C = 10 mAdc, V_{CE} = 1 Vdc, T_A = -55°C) (I_C = 50 mAdc, V_{CE} = 1 Vdc) (I_C = 100 mAdc, V_{CE} = 1Vdc)		h_{FE}*	20 30 15 25 15	-- 120 -- -- --	--
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 1 MHz)		C_{ob}	--	6	pF
Input Capacitance (V_{BE} = 0.5 Vdc, I_C = 0, f = 1 MHz)		C_{ib}	--	5	pF
Current-Gain - Bandwidth Product (I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 100 MHz)		f_T	700	--	MHz
Total Control Charge (I_C = 50 mA, I_B = 5 mA, V_{CC} = 3 V)		Q_T	--	400	pC
Delay Time	I_C = 50 mA, I_{B1} = 5mA,	t_d	--	10	ns
Rise Time	V_{BE} = 2 V, V_{CC} = 3 V	t_r	--	15	ns
Storage Time	I_C = 50 mA, I_{B1} = I_{B2} = 5 mA,	t_s	--	20	ns
Fall Time	V_{CC} = 3 V	t_f	--	15	ns
Turn-On Time	(See Figure 3,4,5)	t_{on}	--	40	ns
Turn-Off Time		t_{off}	--	30	ns

*Pulse Test: PW = 300 μs, Duty Cycle ≤ 2%

2N3546 (continued)

FIGURE 1

LIMITS OF SATURATION VOLTAGES

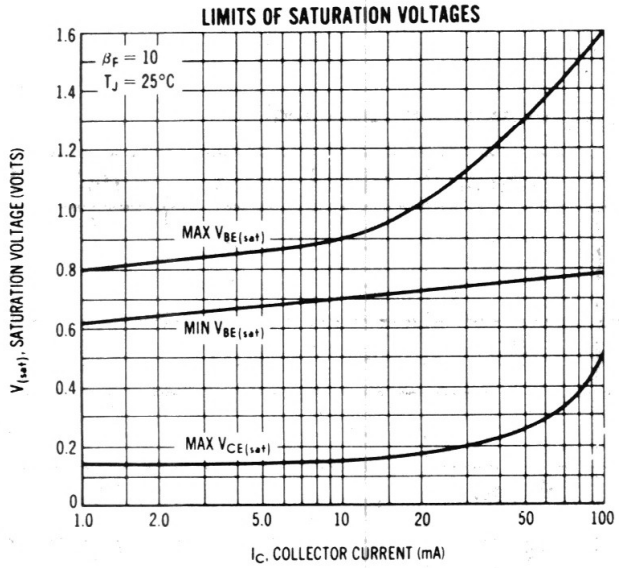


FIGURE 2

STORAGE TIME BEHAVIOR

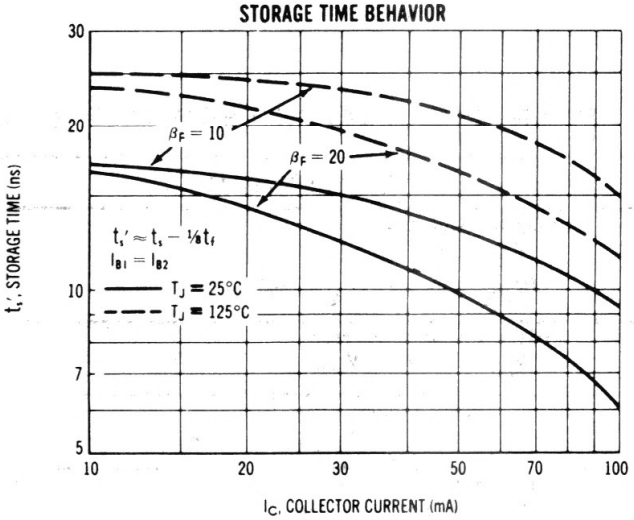
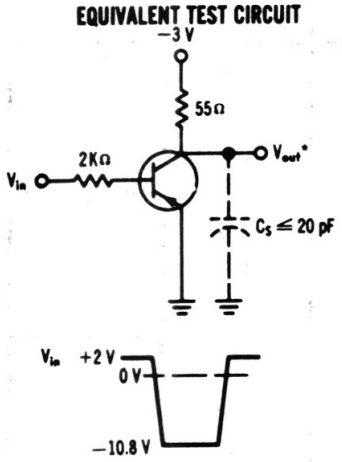


FIGURE 3

DELAY AND RISE TIME EQUIVALENT TEST CIRCUIT

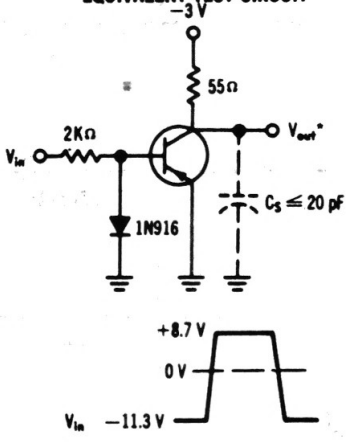


PULSE WIDTH = 200 ns
RISE TIME ≤ 2 ns
DUTY CYCLE ≤ 10%

*OSCILLOSCOPE RISE TIME ≤ 1 ns

FIGURE 4

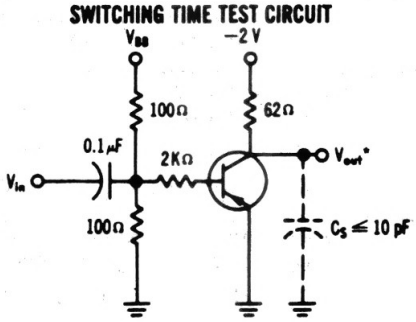
STORAGE AND FALL TIME EQUIVALENT TEST CIRCUIT



PULSE WIDTH = 200 ns
RISE TIME ≤ 2 ns
DUTY CYCLE ≤ 10%

FIGURE 5

SWITCHING TIME TEST CIRCUIT



PULSE WIDTH > 200 ns
RISE TIME < 1 ns
$Z_{in} = 50\Omega$

t_{on} : $V_{BB} = +3$ V, $V_{in} = -7$ V
t_{off} : $V_{BB} = -4$ V, $V_{in} = +6$ V

FIGURE 6

MINIMUM CURRENT GAIN CHARACTERISTICS