2N3304 (SILICON)

CASE 22
(TO-18)

Collector connected to case

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

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	6.0	Vdc
Collector-Base Voltage	V_{CB}	6.0	Vdc
Emitter-Base Voltage	V_{EB}	4.0	Vdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	300 1.72	mW mW/°C
Total Device Dissipation @ T_C = 100°C Derate above 100°C	P_D	500 5.0	mW mW/°C
Operating & Storage Junction Temperature Range	T_J, T_{stg}	-65 to+200	°C

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Sustaining Voltage (1) (I_C = 10 mAdc, I_B = 0)	$BV_{CEO(sus)}$	6.0		Vdc
Collector-Emitter Breakdown Voltage (I_C = 100 μAdc, V_{BE} = 0)	BV_{CES}	6.0	—	Vdc
Collector-Base Breakdown Voltage (I_C = 100 μAdc, I_E = 0)	BV_{CBO}	6.0	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 100 μAdc, I_C = 0)	BV_{EBO}	4.0	—	Vdc
Collector-Cutoff Current (V_{CE} = 3 Vdc, V_{BE} = 0)	I_{CES}	—	0.01	μAdc
(V_{CE} = 3 Vdc, V_{BE} = 0, T_A = +125°C)		—	10	
Base Current (V_{CE} = 3 Vdc, V_{BE} = 0)	I_B	—	10	nAdc
ON CHARACTERISTICS				
DC Current Gain (1) (I_C = 1 mAdc, V_{CE} = 0.5 Vdc)	h_{FE}	15	—	—
(I_C = 10 mAdc, V_{CE} = 0.3 Vdc, T_A = -55°C)		12	—	
(I_C = 10 mAdc, V_{CE} = 0.3 Vdc)		30	120	
(I_C = 50 mAdc, V_{CE} = 1.0 Vdc)		20	—	
Collector-Emitter Saturation Voltage (I_C = 1 mAdc, I_B = 0.1 mAdc)	$V_{CE(sat)}$	—	0.15	Vdc
(I_C = 10 mAdc, I_B = 1 mAdc, T_A = +125°C)		—	0.23	
(I_C = 10 mAdc, I_B = 1 mAdc)		—	0.16	
(I_C = 50 mAdc, I_B = 5 mAdc)		—	0.5	
Base-Emitter Saturation Voltage (I_C = 1 mAdc, I_B = 0.1 mAdc)	$V_{BE(sat)}$	0.7	0.8	Vdc
(I_C = 10 mAdc, I_B = 1 mAdc)		0.8	1.0	
(I_C = 50 mAdc, I_B = 5 mAdc)		—	1.5	
DYNAMIC CHARACTERISTICS				
Current-Gain—Bandwidth Product (I_C = 10 mAdc, V_{CE} = 5 Vdc, f = 100 MHz)	f_T	500	—	MHz
Output Capacitance (V_{CB} = 5 Vdc, I_E = 0, f = 140 kHz)	C_{ob}	—	3.5	pF
Input Capacitance (V_{BE} = 0.5 Vdc, I_C = 0, f = 140 kHz)	C_{ib}	—	3.5	pF
Turn-On Time (Figure 1) (V_{CC} = 1.5 Vdc, V_{BB} = 6 Vdc, I_C = 10 mAdc, I_{B1} = I_{B2} = 0.5 mAdc)	t_{on}	—	60	ns
Turn-Off Time (Figure 1) (V_{CC} = 1.5 Vdc, I_C = 10 mAdc, I_{B1} = I_{B2} = 0.5 mAdc)	t_{off}	—	60	ns
Charge-Storage Time (Figure 2) (I_C = 10 mAdc, V_{CC} = 3 Vdc, I_{B1} = I_{B2} = 10 mAdc)	t_s	—	30	ns

(1) Pulse Test: Pulse Width = 300 μs; Duty Cycle = 2%

FIGURE 1 — TURN-ON & TURN-OFF TIME TEST CIRCUIT

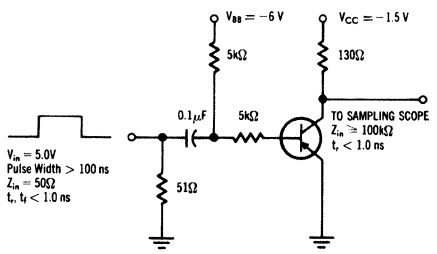

FIGURE 2 — CHARGE-STORAGE TIME TEST CIRCUIT