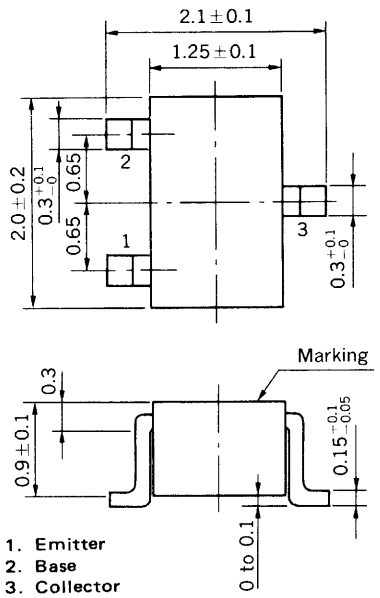
NEC
ELECTRON DEVICE

SILICON TRANSISTOR
2SC4176

HIGH SPEED SWITCHING
NPN SILICON EPITAXIAL TRANSISTOR

PACKAGE DIMENSIONS
in millimeters



1. Emitter
2. Base
3. Collector

FEATURE

- High Speed: $t_{on} < 12$ ns $t_{off} < 18$ ns

ABSOLUTE MAXIMUM RATINGS

Maximum Voltages and Current (T_a = 25 °C)

Collector to Base Voltage	V_{CBO}	40	V
Collector to Emitter Voltage	V_{CEO}	15	V
Emitter to Base Voltage	V_{EBO}	5.0	V
Collector Current (DC)	I_C	200	mA
Maximum Power Dissipation			
Total Power Dissipation			
at 25 °C Ambient Temperature	P_T	150	mW
Maximum Temperatures			
Junction Temperature	T_j	150	°C
Storage Temperature Range	T_{stg}	−55 to +150	°C

ELECTRICAL CHARACTERISTICS (T_a = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Collector Cutoff Current	I_{CBO}			100	nA	V_{CB} = 20 V, I_E = 0
Emitter Cutoff Current	I_{EBO}			100	nA	V_{EB} = 3.0 V, I_C = 0
DC Current Gain	h_{FE1}	40	90	200		V_{CE} = 1.0 V, I_C = 10 mA
Collector Saturation Voltage	$V_{CE(sat)}$		0.15	0.25	V	I_C = 10 mA, I_B = 1.0 mA
Base Saturation Voltage	$V_{BE(sat)}$		0.80	0.85	V	I_C = 10 mA, I_B = 1.0 mA
Gain Bandwidth Product	f_T	500	750		MHz	V_{CE} = 10 V, I_E = −10 mA
Output Capacitance	C_{ob}		1.8	4.0	pF	V_{CB} = 5.0 V, I_E = 0, f = 1.0 MHz
Turn-on Time	t_{on}		8.0	12	ns	See Test Circuit
Storage Time	t_{stg}		6.0	13	ns	
Turn-off Time	t_{off}		12	18	ns	

* Pulsed: PW ≤ 350 μs, Duty Cycle ≤ 2 %

h_{FE} Classification

Marking	B33	B34	B35
h_{FE}	40 to 80	60 to 120	100 to 200

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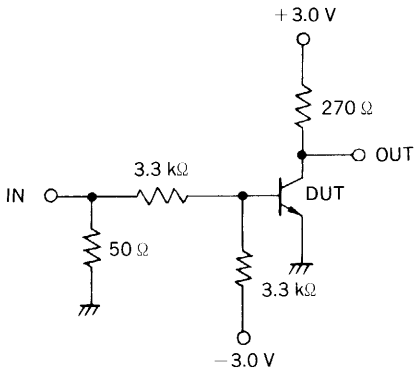
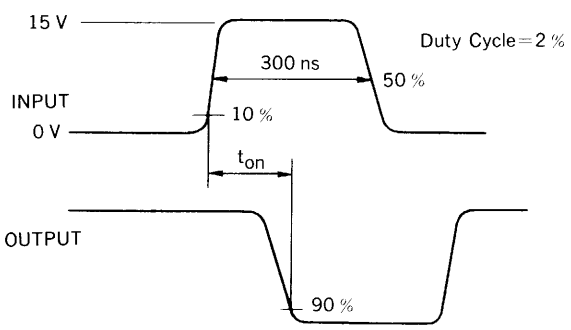
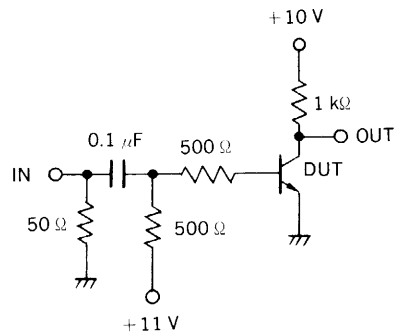
SWITCHING TIME TEST CIRCUIT



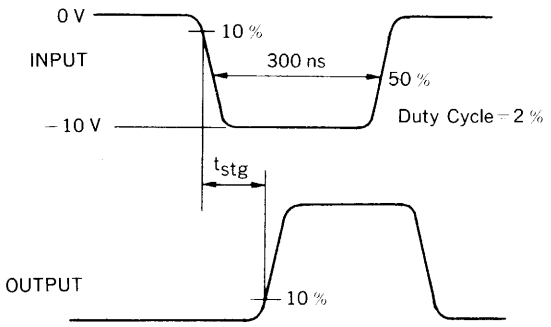
t_{on} SWITCHING

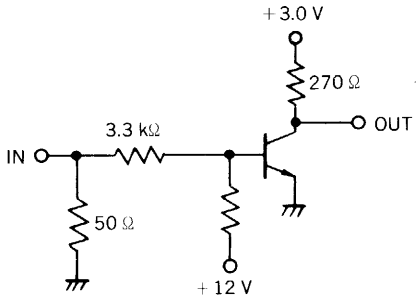


VOLTAGE WAVEFORMS

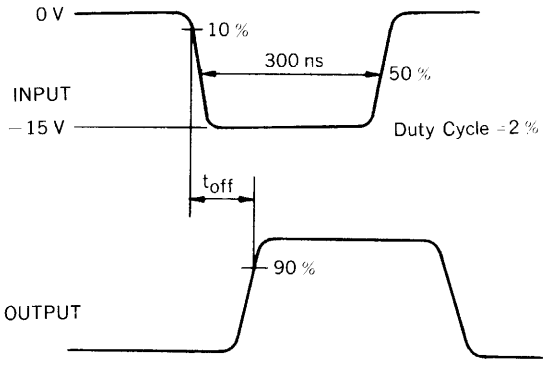


t_{stg} SWITCHING



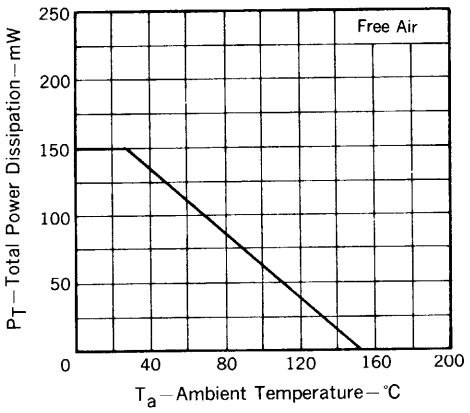


t_{off} SWITCHING

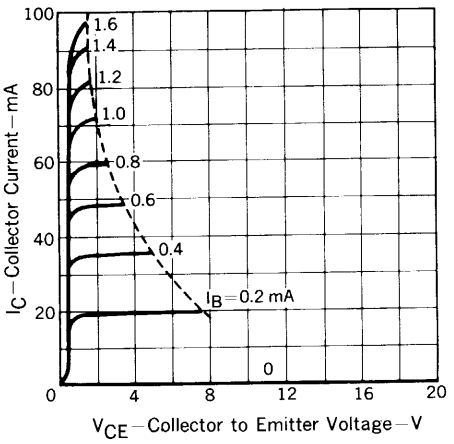


TYPICAL CHARACTERISTICS (T_a = 25 °C)

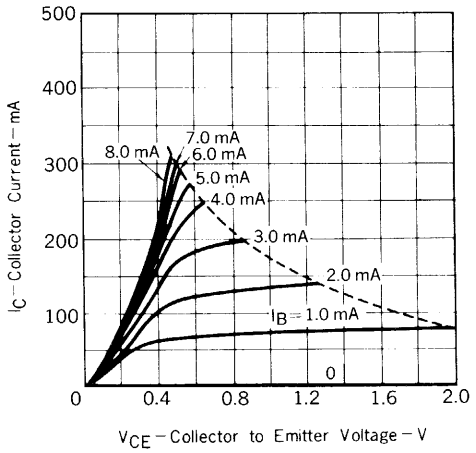
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



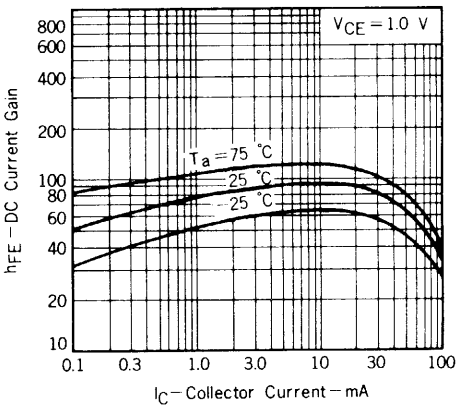
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



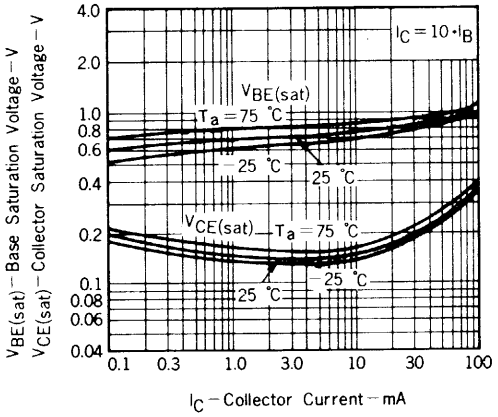
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



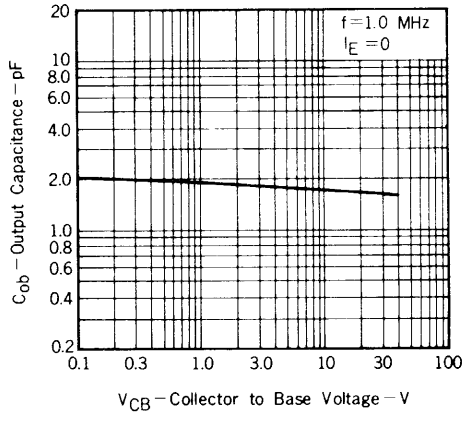
DC CURRENT GAIN vs. COLLECTOR CURRENT



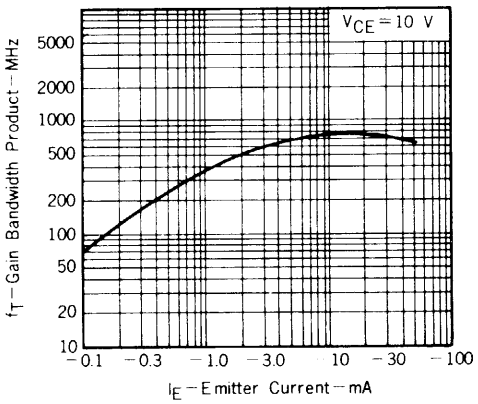
COLLECTOR AND BASE SATURATION VOLTAGE vs. COLLECTOR CURRENT



OUTPUT CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



GAIN BANDWIDTH PRODUCT
vs. EMITTER CURRENT



SWITCHING TIME
vs. COLLECTOR CURRENT