

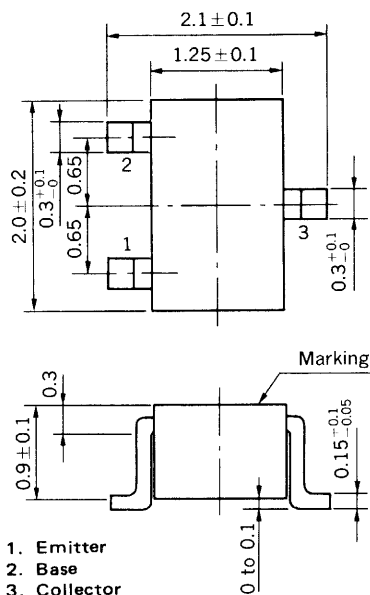
# SILICON TRANSISTOR

## 2SC4176

### HIGH SPEED SWITCHING

### NPN SILICON EPITAXIAL TRANSISTOR

**PACKAGE DIMENSIONS**  
in millimeters



**FEATURE**

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

**ABSOLUTE MAXIMUM RATINGS**

Maximum Voltages and Current ( $T_a = 25^\circ\text{C}$ )

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 $25^\circ\text{C}$ Ambient Temperature	$P_T$	150	mW
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Maximum Temperatures

Junction Temperature	$T_j$	150	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-55 to +150	$^\circ\text{C}$

**ELECTRICAL CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ )**

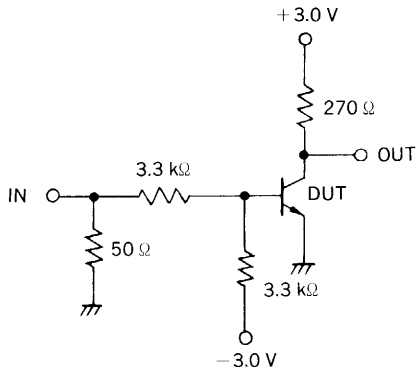
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Collector Cutoff Current	$I_{CBO}$			100	nA	$V_{CB} = 20 \text{ V}, I_E = 0$
Emitter Cutoff Current	$I_{EBO}$			100	nA	$V_{EB} = 3.0 \text{ V}, I_C = 0$
DC Current Gain	$h_{FE1}$	40	90	200		$V_{CE} = 1.0 \text{ V}, I_C = 10 \text{ mA}$
Collector Saturation Voltage	$V_{CE(sat)}$		0.15	0.25	V	$I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}$
Base Saturation Voltage	$V_{BE(sat)}$		0.80	0.85	V	$I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}$
Gain Bandwidth Product	$f_T$	500	750		MHz	$V_{CE} = 10 \text{ V}, I_E = -10 \text{ mA}$
Output Capacitance	$C_{ob}$		1.8	4.0	pF	$V_{CB} = 5.0 \text{ V}, I_E = 0, f = 1.0 \text{ MHz}$
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:  $PW \leq 350 \mu\text{s}$ , Duty Cycle  $\leq 2\%$

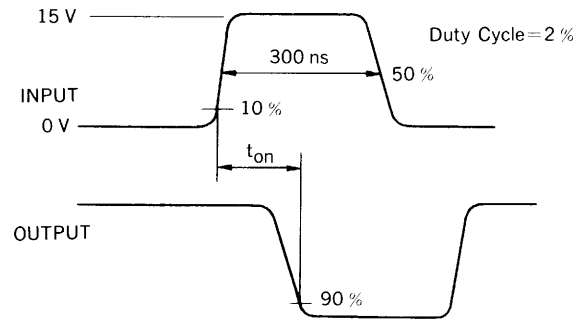
**$h_{FE}$  Classification**

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

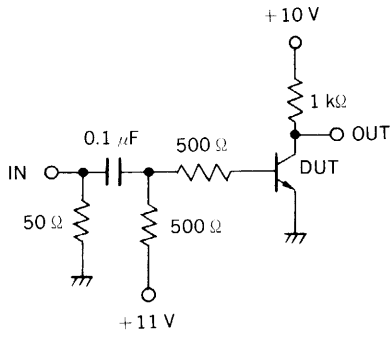
SWITCHING TIME TEST CIRCUIT



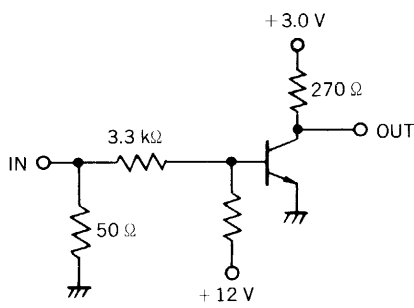
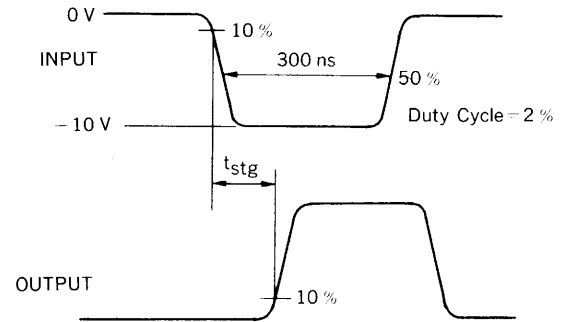
$t_{on}$  SWITCHING



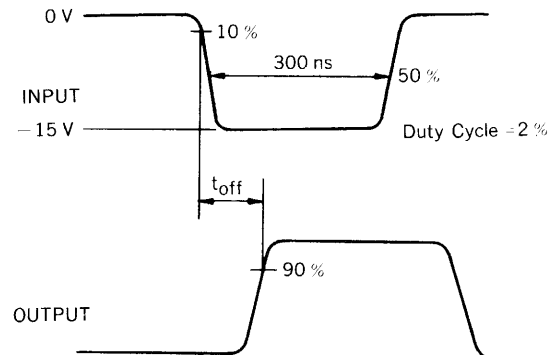
VOLTAGE WAVEFORMS



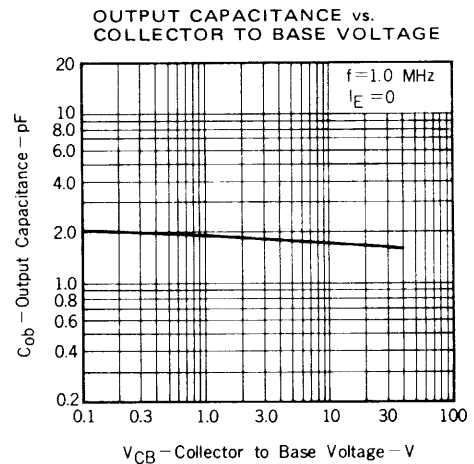
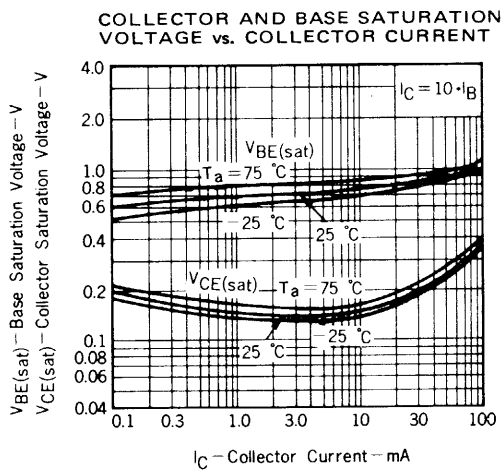
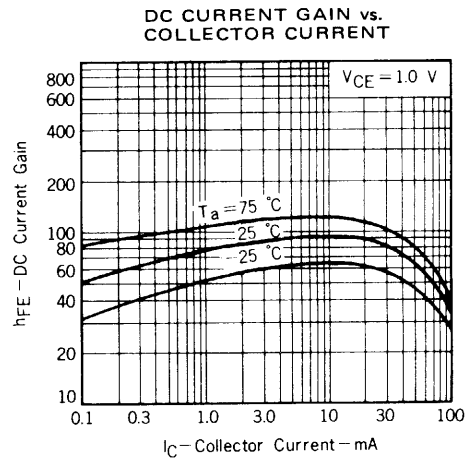
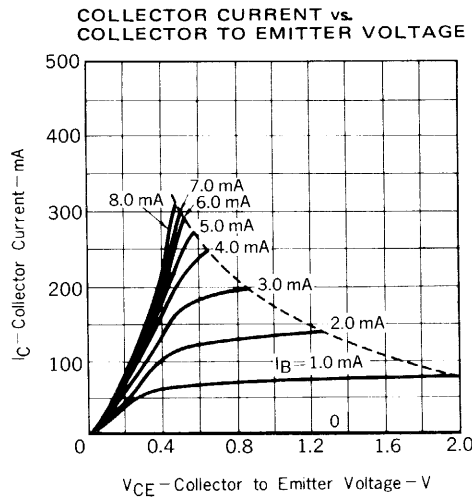
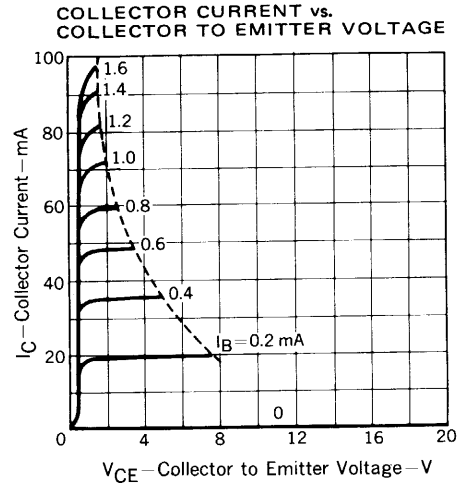
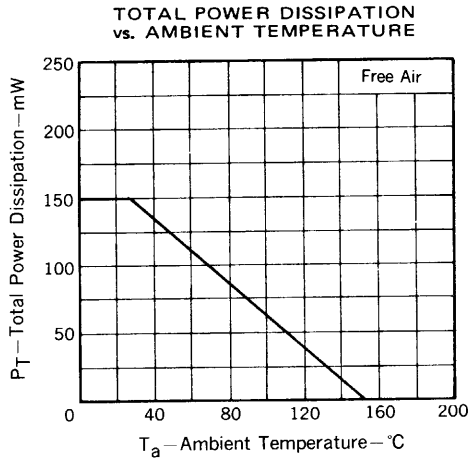
$t_{stg}$  SWITCHING

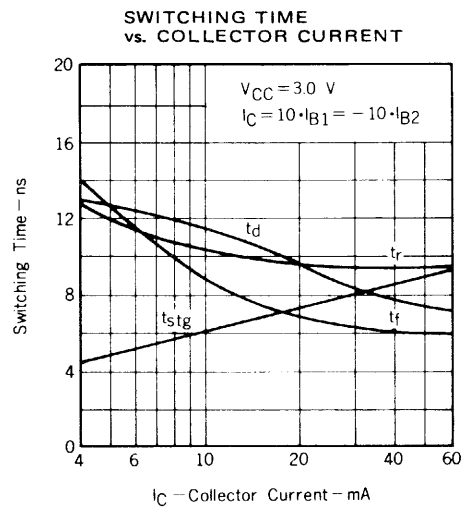
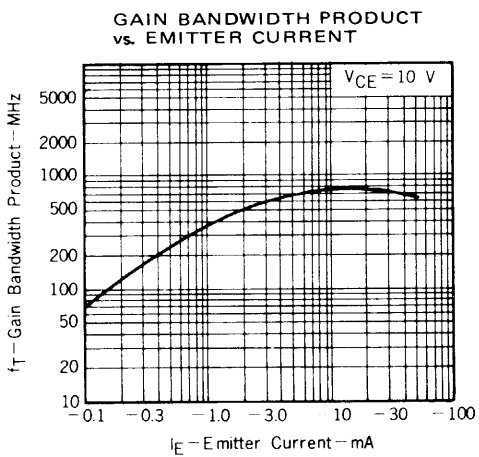


$t_{off}$  SWITCHING



TYPICAL CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ )







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