

BIPOLAR TRANSISTOR SWITCHING TIME

THE GOOD, THE BAD, THE UGLY !

GOOD

- SIMPLE CONCEPT: OPERATION AS A SWITCH

HOW LONG DOES IT TAKE TO SWITCH
BETWEEN CUTOFF & SATURATION,
AND VICE-VERSA.

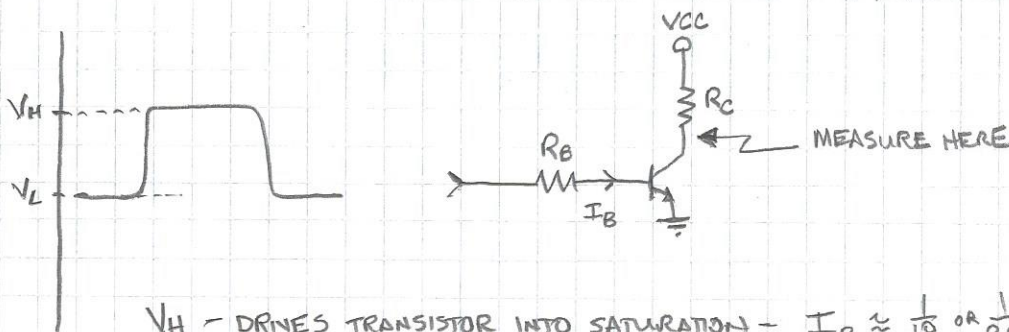
CUTOFF: TRANSISTOR IS "OFF"
SATURATION: TRANSISTOR IS "ON"

BAD

- NO STANDARD TEST CIRCUIT
- NO STANDARD TEST CONDITIONS
- TEST METHODS VARY BY MANUFACTURER & DEVICE TYPE

UGLY

- RESULTS DEPENDENT UPON TEST CONDITIONS
- CONSISTS OF 4 (OR EVEN 6) PARAMETERS

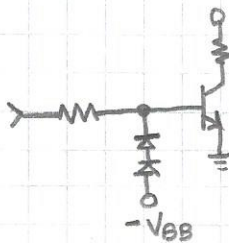


V_H - DRIVES TRANSISTOR INTO SATURATION - $I_B \approx \frac{1}{10}$ OR $\frac{1}{20}$ OF I_C

V_L - TURNS TRANSISTOR OFF. SOMETIMES $0V$, SOMETIMES NEGATIVE

- SOMETIMES DIFFERENT DRIVE CONDITIONS FOR TURN ON & TURN OFF

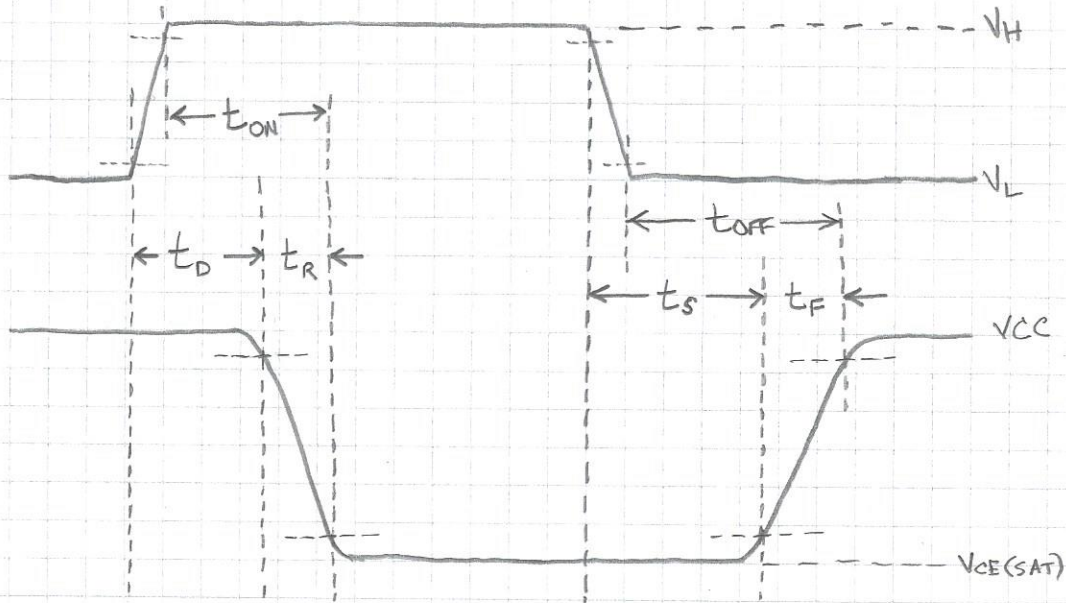
- SOMETIMES DIODE CLAMP
USED FOR TURN OFF



SWITCHING TIME DEFINITIONS

W2AEW

(2)



INPUT *
RISE & FALL < 10ns
TYPICALLY 1-2ns

VOLTAGE ON
COLLECTOR

*NOTE: OFTEN FAST ENOUGH THAT EDGES
ARE CONSIDERED "VERTICAL"

MAIN 4 PARAMETERS

t_D = DELAY TIME : TIME FOR I_C TO BEGIN INCREASING

t_R = RISE TIME : TIME FOR I_C TO GO FROM 10% TO 90%

t_S = STORAGE TIME : TIME FOR STORE CHARGE TO BE REMOVED
AND COLLECTOR CURRENT TO BEGIN FALLING

t_F = FALL TIME : TIME FOR I_C TO GO FROM 90% TO 10%

COMBINATION PARAMETERS (LESS COMMON)

t_{ON} = TURN ON TIME

t_{OFF} = TURN OFF TIME

} DEFINITIONS NOT CONSISTENT

SWITCHING TIME TEST CIRCUIT

W2AEW

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