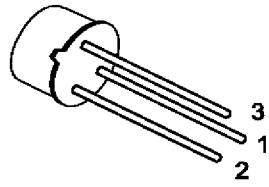
SGS-THOMSON MICROELECTRONICS

# 2N4033

## GENERAL PURPOSE AMPLIFIER AND SWITCH

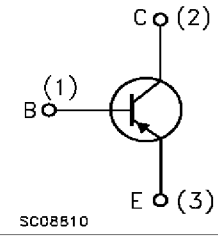
**DESCRIPTION**

The 2N4033 is a silicon planar epitaxial PNP transistors in Jedec TO-39 metal case primary intended for large signal, low noise industrial applications.




**TO-39**

**INTERNAL SCHEMATIC DIAGRAM**




**ABSOLUTE MAXIMUM RATINGS**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{CBO}$ | Collector-Base Voltage ($I_E$ = 0) | -80 | V |
| $V_{CEO}$ | Collector-Emitter Voltage ($I_B$ = 0) | -80 | V |
| $V_{EBO}$ | Emitter-Base Voltage ($I_C$ = 0) | -5 | V |
| $I_C$ | Collector Current | -1 | A |
| $P_{tot}$ | Total Dissipation at $T_{amb} \leq 45\ ^oC$<br>at $T_{case} \leq 45\ ^oC$ | 0.8<br>4 | W<br>W |
| $T_{stg}$ | Storage Temperature | -55 to 200 | $^oC$ |
| $T_j$ | Max. Operating Junction Temperature | 200 | $^oC$ |

## THERMAL DATA

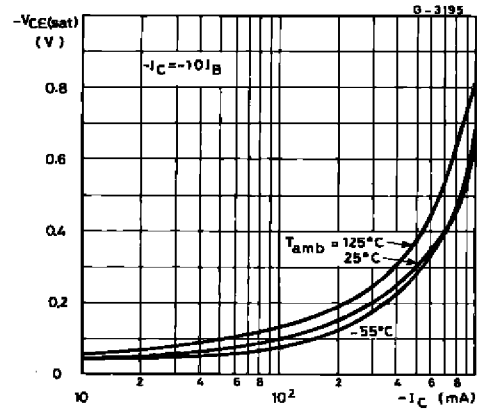
| | | | |
|---|---|---|---|
| $R_{thj\text{-}case}$ | Thermal Resistance Junction-Case Max | 44 | °C/W |
| $R_{thj\text{-}amb}$ | Thermal Resistance Junction-Ambient Max | 218 | °C/W |

## ELECTRICAL CHARACTERISTICS ($T_{case}$ = 25 °C unless otherwise specified)

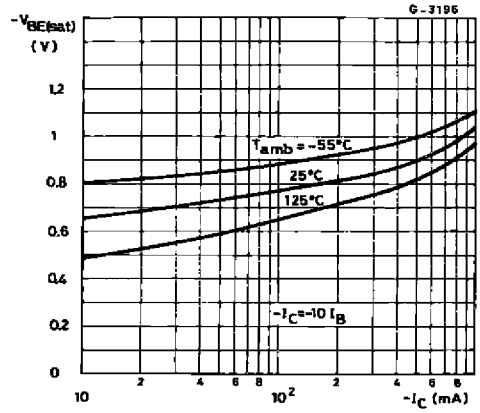
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{CBO}$ | Collector Cut-off Current ($I_E$ = 0) | $V_{CE}$ = -60 V<br>$V_{CE}$ = -60 V $T_{amb}$ = 150 °C | | | -50<br>-50 | nA<br>µA |
| $V_{(BR)CBO}$* | Collector-Base Breakdown Voltage ($I_E$ = 0) | $I_C$ = -10 µA | -80 | | | V |
| $V_{(BR)CEO}$* | Collector-Emitter Breakdown Voltage ($I_B$ = 0) | $I_C$ = -10 mA | -80 | | | V |
| $V_{(BR)EBO}$* | Emitter-Base Breakdown Voltage ($I_C$ = 0) | $I_E$ = -10 µA | -5 | | | V |
| $V_{CE(sat)}$* | Collector-Emitter Saturation Voltage | $I_C$ = -150 mA $I_B$ = -15 mA<br>$I_C$ = -500 mA $I_B$ = -50 mA | | | -0.15<br>-0.5 | V<br>V |
| $V_{BE(sat)}$* | Base-Emitter Saturation Voltage | $I_C$ = -150 mA $I_B$ = -15 mA<br>$I_C$ = -500 mA $I_B$ = -50 mA | | | -0.9<br>-1.1 | V<br>V |
| $h_{FE}$* | DC Current Gain | $I_C$ = -100 µA $V_{CE}$ = -5 V<br>$I_C$ = -100 mA $V_{CE}$ = -5 V<br>$I_C$ = -500 mA $V_{CE}$ = -5 V<br>$I_C$ = -1 A $V_{CE}$ = -5 V<br>$I_C$ = -100 mA $V_{CE}$ = -5 V<br>$T_{amb}$ = -55 °C | 75<br>100<br>70<br>25<br><br>40 | | 300 | |
| $f_T$ | Transition Frequency | $I_C$ = -50 mA $V_{CE}$ = -10 V<br>f = 100 MHz | 150 | | 500 | MHz |
| $C_{EBO}$ | Emitter Base Capacitance | $I_E$ = 0 $V_{EB}$ = -0.5 V f = 1MHz | | | 110 | pF |
| $C_{CBO}$ | Collector Base Capacitance | $I_E$ = 0 $V_{CB}$ = -10 V f = 1MHz | | | 20 | pF |
| $t_s$** | Storage Time | $I_C$ = -500 mA $V_{CE}$ = -30 V<br>$I_{B1}$ = -$I_{B2}$ = -50 mA | | | 350 | ns |
| $t_f$** | Fall Time | $I_C$ = -500 mA $V_{CE}$ = -30 V<br>$I_{B1}$ = -$I_{B2}$ = -50 mA | | | 50 | ns |
| $t_{on}$** | Turn-on Time | $I_C$ = -500 mA $V_{CE}$ = -30 V<br>$I_{B1}$ = -$I_{B2}$ = -50 mA | | | 100 | ns |

* Pulsed: Pulse duration = 300 µs, duty cycle ≤ 1 %
** See Test Circuit

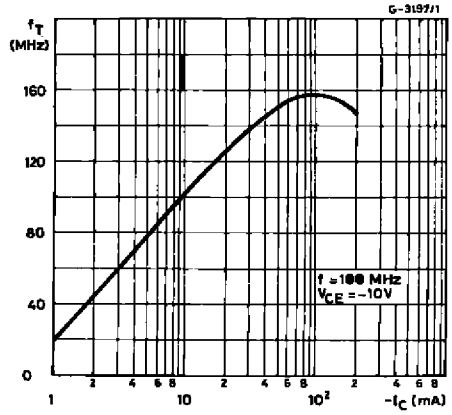
Collector-emitter Saturation Voltage.



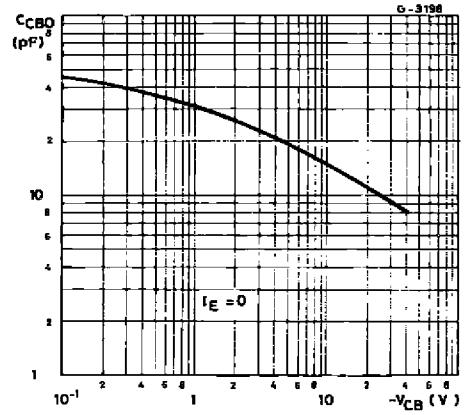

Base-emitter Saturation Voltage.



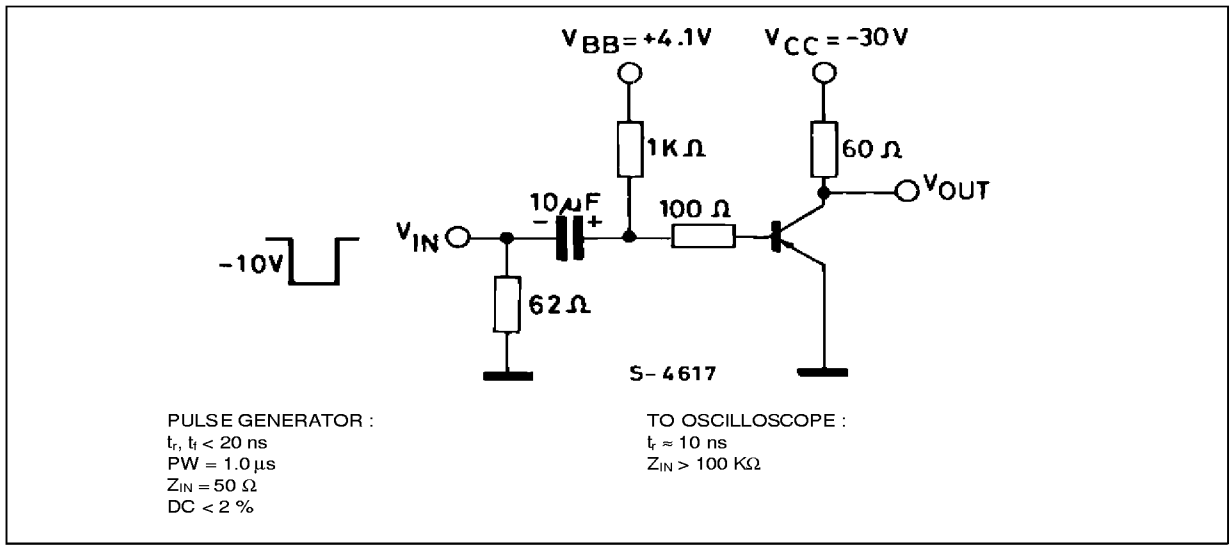

Transition Frequency.




Collector-base Capacitance.



Test Circuit for $t_{on}$, $t_s$, $t_f$.

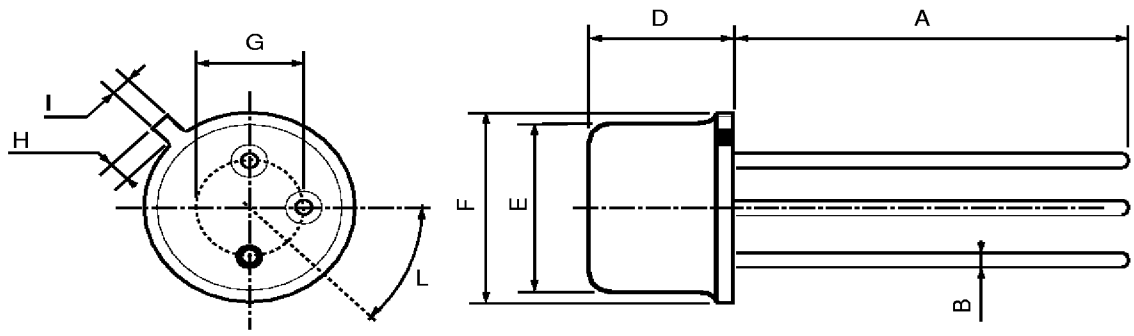



PULSE GENERATOR :
$t_r$, $t_f$ < 20 ns
PW = 1.0 μs
$Z_{IN}$ = 50 Ω
DC < 2 %

TO OSCILLOSCOPE :
$t_r$ ≈ 10 ns
$Z_{IN}$ > 100 KΩ

## TO-39 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 12.7 | | | 0.500 | | |
| B | | | 0.49 | | | 0.019 |
| D | | | 6.6 | | | 0.260 |
| E | | | 8.5 | | | 0.334 |
| F | | | 9.4 | | | 0.370 |
| G | 5.08 | | | 0.200 | | |
| H | | | 1.2 | | | 0.047 |
| I | | | 0.9 | | | 0.035 |
| L | $45^{o}$ (typ.) | | | | | |

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