DATA SHEET

NEC

# SILICON POWER TRANSISTOR

# 2SB601

## PNP SILICON EPITAXIAL TRANSISTOR (DARLINGTON CONNECTION) FOR LOW-FREQUENCY POWER AMPLIFIERS AND LOW-SPEED SWITCHING

### FEATURES

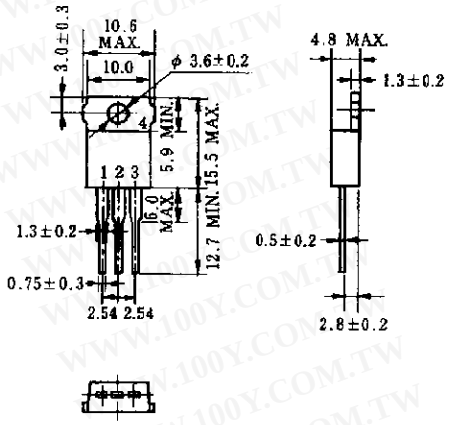
- High-DC current gain due to Darlington connection
- Low collector saturation voltage
- Low collector cutoff current
- Ideal for use in direct drive from IC output for magnet drivers such as treminal equipment or cash registers

### ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

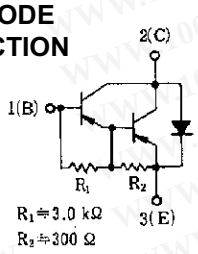
| Parameter | Symbol | Ratings | Unit |
|---|---|---|---|
| Collector to base voltage | $V_{CBO}$ | −100 | V |
| Collector to emitter voltage | $V_{CEO}$ | −100 | V |
| Emitter to base voltage | $V_{EBO}$ | −7.0 | V |
| Collector current | $I_{C(DC)}$ | ∓5.0 | A |
| Collector current | $I_{C(pulse)}$* | ∓8.0 | A |
| Base current | $I_{B(DC)}$ | −0.5 | A |
| Total power dissipation | $P_T$ (Ta = 25°C) | 1.5 | W |
| Total power dissipation | $P_T$ (Tc = 25°C) | 30 | W |
| Junction temperature | $T_j$ | 150 | °C |
| Storage temperature | $T_{stg}$ | −55 to +150 | °C |

* PW ≤ 10 ms, duty cycle ≤ 50%

### PACKAGE DRAWING (UNIT: mm)




### ELECTRODE CONNECTION




1. Base(B)
2. Collector(C)
3. Emitter(E)
4. Fin(Collector)

EIAJ : SC-46
JEDEC : TO-220AB
IEC : —



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## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| Parameter | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Collector to emitter voltage | $V_{CEO(SUS)}$ | $I_C$ = –3 A, $I_{B1}$ = –3 mA, L = 1 mH | –100 | | | V |
| Collector to emitter voltage | $V_{CEX(SUS)1}$ | $I_C$ = –3 A, $I_{B1}$ = –$I_{B2}$ = –3 mA, $V_{BE(OFF)}$ = 5.0 V, L = 180 μH, clamped | –100 | | | V |
| Collector to emitter voltage | $V_{CEX(SUS)2}$ | $I_C$ = –6 A, $I_{B1}$ = –12 mA, $I_{B2}$ = 3 mA, $V_{BE(OFF)}$ = 5.0 V, L = 180 μH, clamped | –100 | | | V |
| Collector cutoff current | $I_{CBO}$ | $V_{CB}$ = –100 V, $I_E$ = 0 | | | –10 | μA |
| Collector cutoff current | $I_{CER}$ | $V_{CE}$ = –100 V, $R_{BE}$ = 51 Ω, Ta = 125°C | | | –1.0 | mA |
| Collector cutoff current | $I_{CEX1}$ | $V_{CE}$ = –100 V, $V_{BE(OFF)}$ = 1.5 V | | | –10 | μA |
| Collector cutoff current | $I_{CEX2}$ | $V_{CE}$ = –100 V, $V_{BE(OFF)}$ = 1.5 V, Ta = 125°C | | | –1.0 | mA |
| Emitter cutoff current | $I_{EBO}$ | $V_{EB}$ = –5.0 V, $I_C$ = 0 | | | –3.0 | mA |
| DC current gain | $h_{FE1}$* | $V_{CE}$ = –2.0 V, $I_C$ = –3.0 A | 2,000 | | 15,000 | |
| DC current gain | $h_{FE2}$* | $V_{CE}$ = –2.0 V, $I_C$ = –5.0 A | 500 | | | |
| Collector saturation voltage | $V_{CE(sat)}$* | $I_C$ = –3.0 A, $I_B$ = –3.0 mA | | | –1.5 | V |
| Base saturation voltage | $V_{BE(sat)}$* | $I_C$ = –3.0 A, $I_B$ = –3.0 mA | | | –2.0 | V |
| Turn-on time | $t_{on}$ | $I_C$ = –3.0 A, $R_L$ = 17 Ω, $I_{B1}$ = –$I_{B2}$ = –3.0 mA, $V_{CC}$ ≅ –50 V Refer to the test circuit. | | 0.5 | | μs |
| Storage time | $t_{stg}$ | | | 1.0 | | μs |
| Fall time | $t_f$ | | | 1.0 | | μs |

* Pulse test PW ≤ 350 μs, duty cycle ≤ 2%

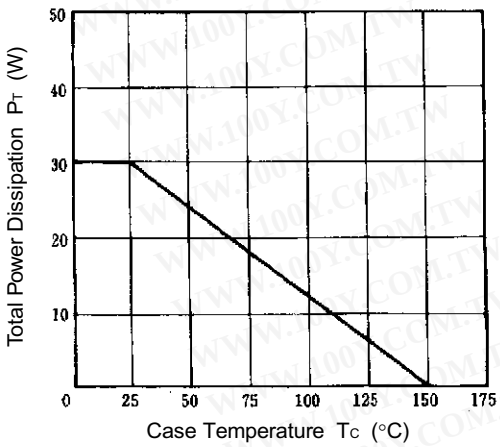
## $h_{FE}$ CLASSIFICATION

| Marking | M | L | K |
|---|---|---|---|
| $h_{FE1}$ | 2,000 to 5,000 | 3,000 to 7,000 | 5,000 to 15,000 |

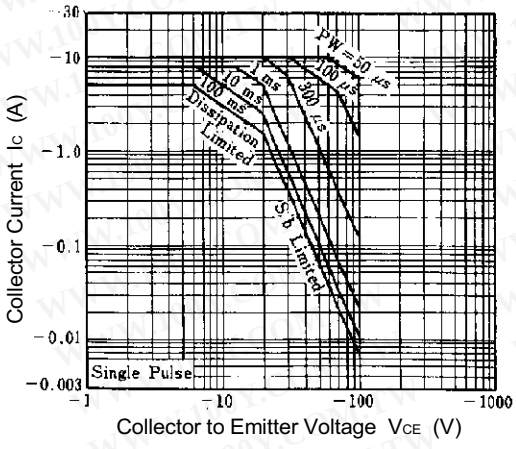


## TYPICAL CHARACTERISTICS (Ta = 25°C)

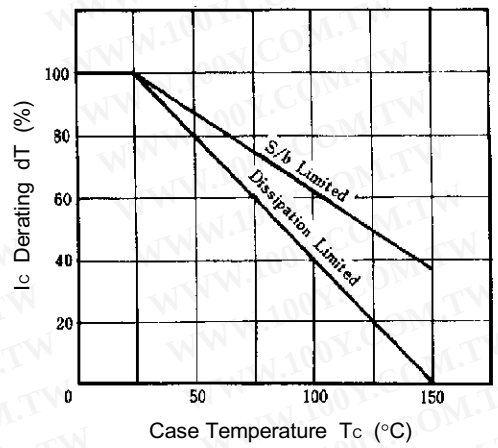
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



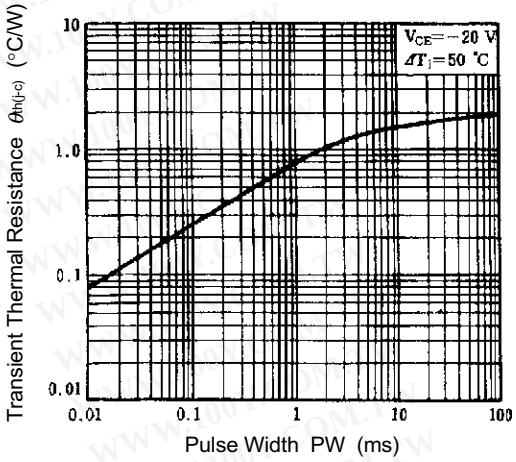

SAFE OPERATING AREAS



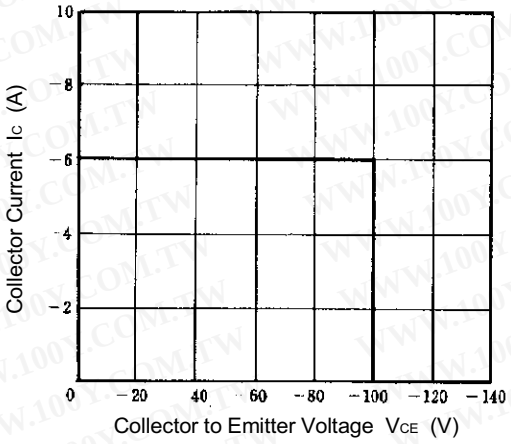
DERATING CURVE OF SAFE OPERATING AREA



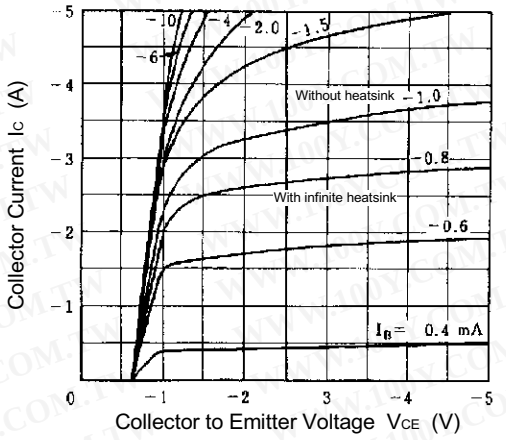

TRANSIENT THERMAL RESISTANCE



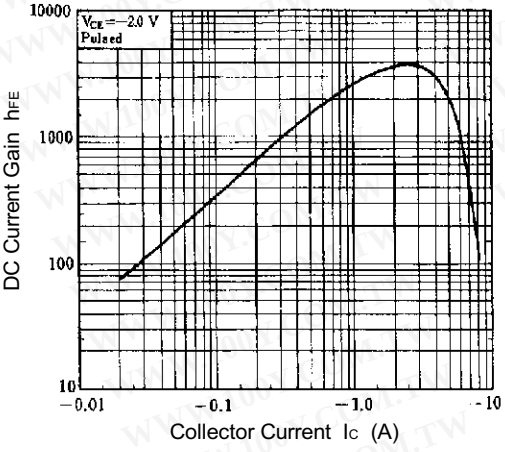

REVERSE BIAS SAFE OPERATING AREAS



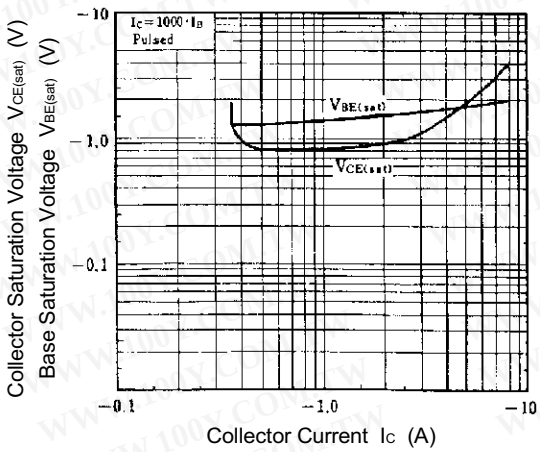

COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



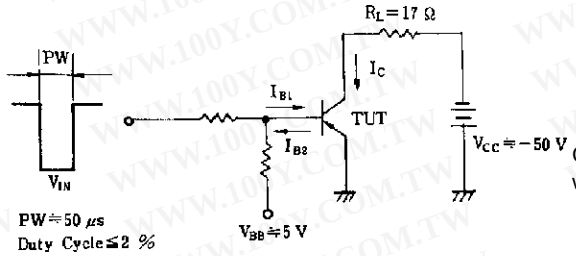

DC CURRENT GAIN vs. COLLECTOR CURRENT

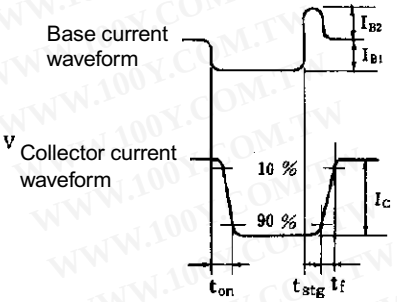



BASE AND COLLECTOR SATURATION VOLTAGE vs. COLLECTOR CURRENT



## SWITCHING TIME ($t_{on}$, $t_{stg}$, $t_f$) TEST CIRCUIT



[MEMO]

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