NEC

# SILICON POWER TRANSISTORS
# 2SA1069, 1069A

## PNP SILICON EPITAXIAL TRANSISTOR FOR HIGH-SPEED SWITCHING

The 2SA1069/1069A are the mold power transistors developed for high-speed switching, and is ideal for use as a driver in devices such as switching regulators, DC/DC converters, and high-frequency power amplifiers.

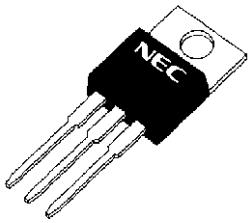
### ORDERING INFORMATION

| Part No. | Package |
|---|---|
| 2SA1069 | TO-220AB |
| 2SA1069A | |

### FEATURES

- Low collector saturation voltage
- Fast switching speed

(TO-220AB)




### ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C)

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Collector to base voltage | $V_{CBO}$ | | –80 | V |
| Collector to emitter voltage | $V_{CEO}$ | | –60/–80 | V |
| Emitter to base voltage | $V_{EBO}$ | | –12 | V |
| Collector current (DC) | $I_{C(DC)}$ | | –5.0 | A |
| Collector current (pulse) | $I_{C(pulse)}$ | PW ≤ 300 μs, duty cycle ≤ 10% | –10 | A |
| Base current (DC) | $I_{B(DC)}$ | | –2.5 | A |
| Total power dissipation | $P_T$ | $T_C$ = 25°C | 30 | W |
| | | $T_A$ = 25°C | 1.5 | W |
| Junction temperature | $T_j$ | | 150 | °C |
| Storage temperature | $T_{stg}$ | | –55 to +150 | °C |



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## ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C)

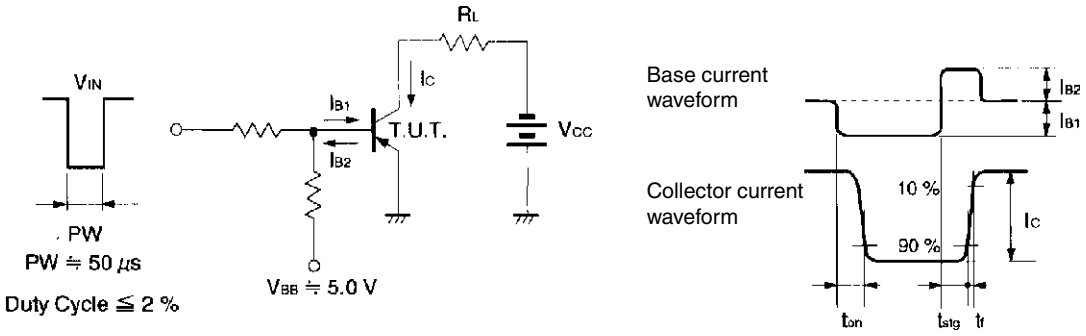
| Parameter | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Collector to emitter voltage | $V_{CEO(SUS)}$ | $I_C$ = –3.0 V, $I_{B1}$ = –0.3 A, L = 1 mH | –60/–80 | | | V |
| Collector to emitter voltage | $V_{CEX(SUS)1}$ | $I_C$ = –3.0 A, $I_{B1}$ = –$I_{B2}$ = –0.3 A, $V_{BE(OFF)}$ = 5.0 V, L = 180 μH, clamped | –60/–80 | | | V |
| Collector to emitter voltage | $V_{CEX(SUS)2}$ | $I_C$ = –6.0 A, $I_{B1}$ = –0.6 A, $I_{B2}$ = 0.3 A, $V_{BE(OFF)}$ = 5.0 V, L = 180 μH, clamped | –60/–80 | | | V |
| Collector cutoff current | $I_{CBO}$ | $V_{CB}$ = –60/–80 V, $I_E$ = 0 A | | | –10 | μA |
| Collector cutoff current | $I_{CER}$ | $V_{CE}$ = –60/–80 V, $R_{BE}$ = 51 Ω, $T_A$ = 125 °C | | | –1.0 | mA |
| Collector cutoff current | $I_{CEX1}$ | $V_{CE}$ = –60/–80 V, $V_{BE(OFF)}$ = 1.5 V | | | –10 | μA |
| Collector cutoff current | $I_{CEX2}$ | $V_{CE}$ = –60/–80 V, $V_{BE(OFF)}$ = 1.5 V, $T_A$ = 125 °C | | | –1.0 | mA |
| Emitter cutoff current | $I_{EBO}$ | $V_{EB}$ = –5.0 V, $I_C$ = 0 A | | | –10 | μA |
| DC current gain | $h_{FE1}$ | $V_{CE}$ = –5.0 V, $I_C$ = –0.3 A[Note] | 40 | | | |
| DC current gain | $h_{FE2}$ | $V_{CE}$ = –5.0 V, $I_C$ = –0.3 A[Note] | 40 | | 200 | |
| Collector saturation voltage | $V_{CE(sat)}$ | $I_C$ = –3.0 A, $I_B$ = –0.3 A[Note] | | | –0.6 | V |
| Base saturation voltage | $V_{BE(sat)}$ | $I_C$ = –3.0 A, $I_B$ = –0.3 A[Note] | | | –1.5 | V |
| Turn-on time | $t_{on}$ | $I_C$ = –3.0 A, $R_L$ = 17 Ω, $I_{B1}$ = –$I_{B2}$ = –0.3 A, $V_{CC}$ ≅ –50 V Refer to the test circuit. | | | 0.5 | μs |
| Storage time | $t_{stg}$ | | | | 2.5 | μs |
| Fall time | $t_f$ | | | | 0.5 | μs |

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

## $h_{FE}$ CLASSIFICATION

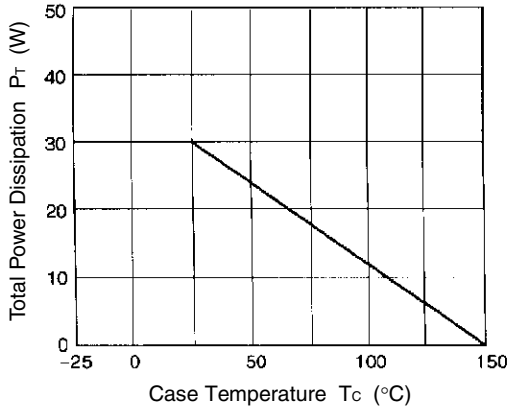
| Marking | M | L | K |
|---|---|---|---|
| $h_{FE2}$ | 40 to 80 | 60 to 120 | 100 to 200 |

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

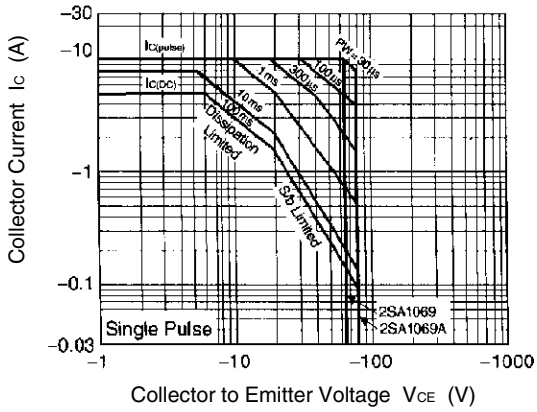


## TYPICAL CHARACTERISTICS ($T_A$ = 25°C)

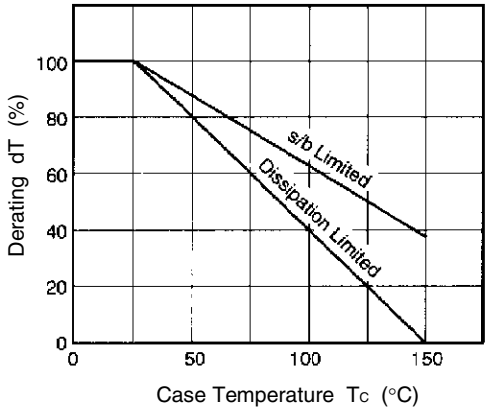
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



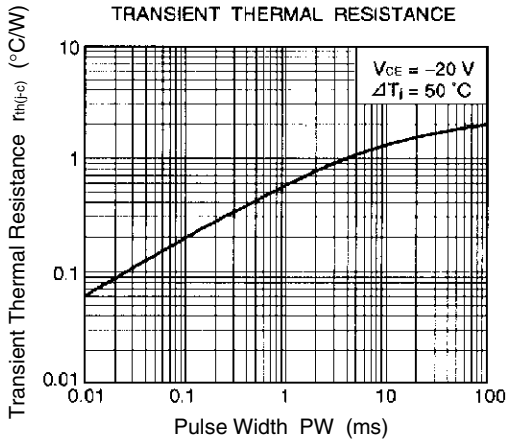

FORWARD BIAS SAFE OPERATING AREA



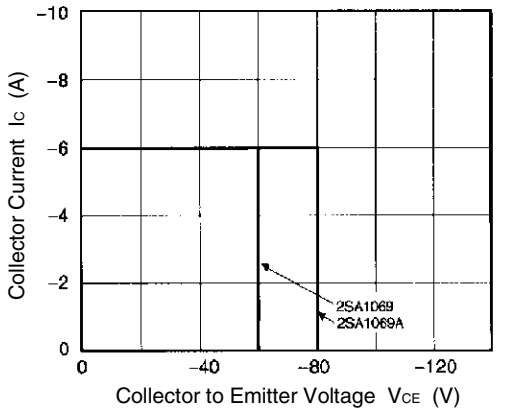

DERATING CURVE OF SAFE OPERATING AREA



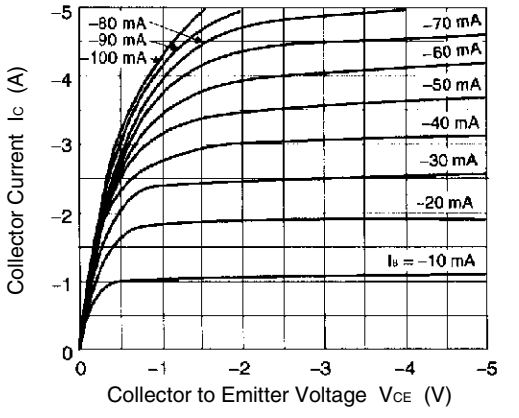

TRANSIENT THERMAL RESIRTANCE



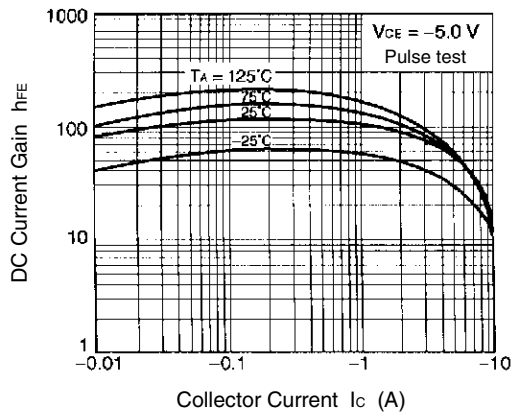

REVERSE BIAS SAFE OPERATING AREA



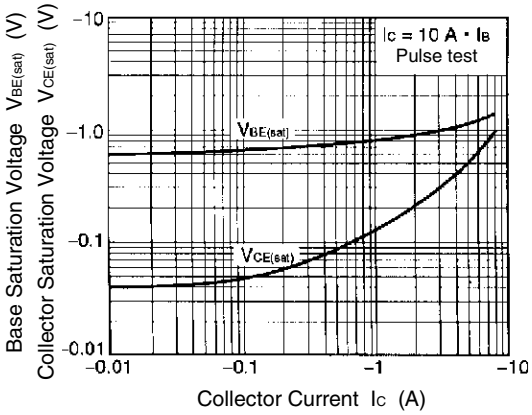

COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



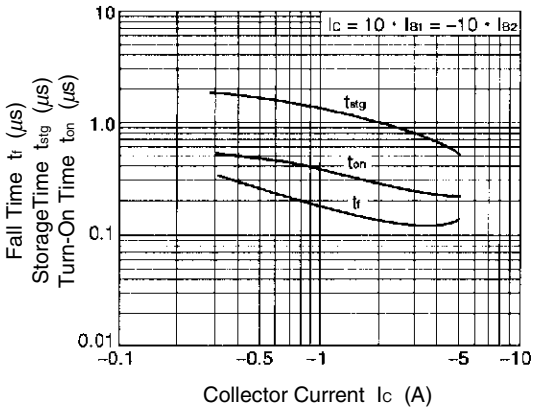
DC CURRENT GAIN vs. COLLECTOR CURRENT




COLLECTOR AND BASE SATURATION VOLTAGE vs. COLLECTOR CURRENT

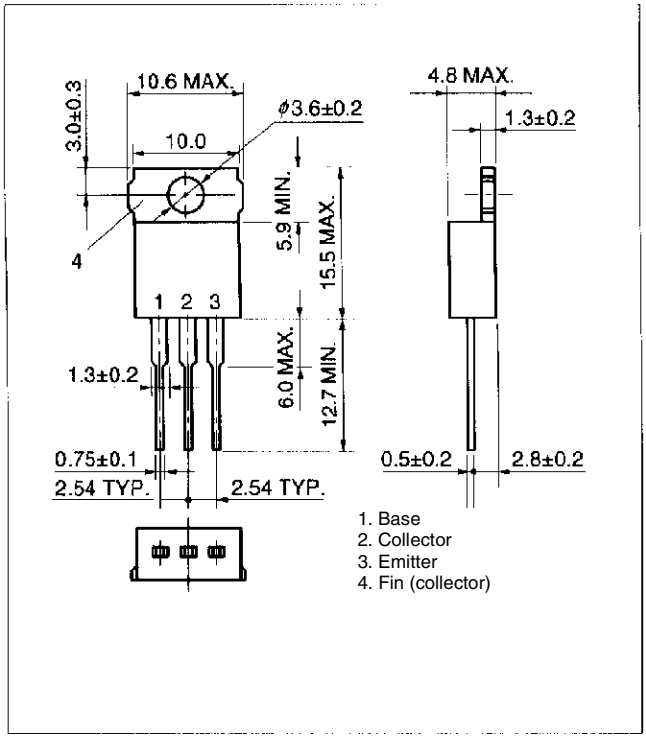



TURN ON TIME, STORAGE TIME AND FALL TIME vs. COLLECTOR CURRENT



## PACKAGE DRAWING (UNIT: mm)

TO-220AB (MP-25)



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