Ordering number:ENN1012A

NPN Triple Diffused Planar Silicon Transistor

# 2SC3089

## 500V/7A Switching Regulator Applications

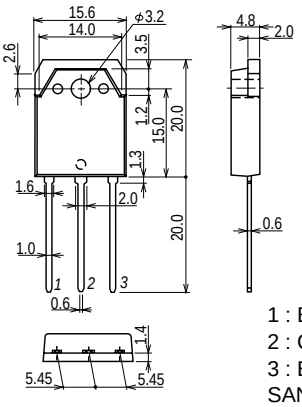
## Features

- High breakdown voltage ($V_{CBO}$≥800V).
- High-speed switching.
- Wide ASO.

## Package Dimensions

unit:mm

2022A




## Specifications

### Absolute Maximum Ratings at Ta = 25˚C

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Collector-to-Base Voltage | $V_{CBO}$ | | 800 | V |
| Collector-to-Emitter Voltage | $V_{CEO}$ | | 500 | V |
| Emitter-to-Base Voltage | $V_{EBO}$ | | 7 | V |
| Collector Current | $I_C$ | | 7 | A |
| Collector Current (Pulse) | $I_{CP}$ | PW≤300μs, Duty Cycle≤10% | 14 | A |
| Base Current | $I_B$ | | 3 | A |
| Collector Dissipation | $P_C$ | | 2.5 | W |
| | | Tc=25˚C | 80 | W |
| Junction Temperature | Tj | | 150 | ˚C |
| Storage Temperature | Tstg | | –55 to +150 | ˚C |

### Electrical Characteristics at Ta = 25˚C

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| Collector Cutoff Current | $I_{CBO}$ | $V_{CB}$=500V, $I_E$=0 | | | 10 | μA |
| Emitter Cutoff Current | $I_{EBO}$ | $V_{EB}$=5V, $I_C$=0 | | | 10 | μA |
| DC Current Gain | $h_{FE}1$ | $V_{CE}$=5V, $I_C$=0.6A | 15* | | 50* | |
| | $h_{FE}2$ | $V_{CE}$=5V, $I_C$=3A | 8 | | | |

Continued on next page.

* : The $h_{FE}1$ of the 2SC3089 is classified as follows. When specifying the $h_{FE}1$ rank, specify two ranks or more in principle.

| Rank | L | M | N |
|---|---|---|---|
| $h_{FE}$ | 15 to 30 | 20 to 40 | 30 to 50 |

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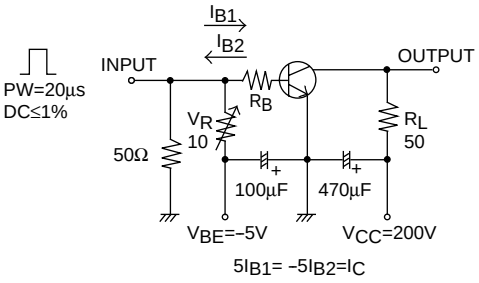
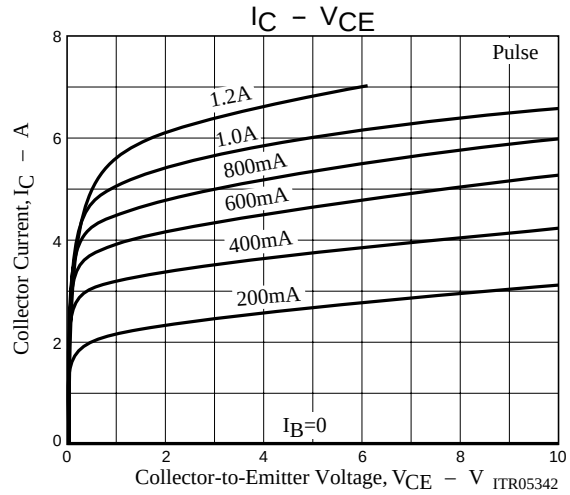
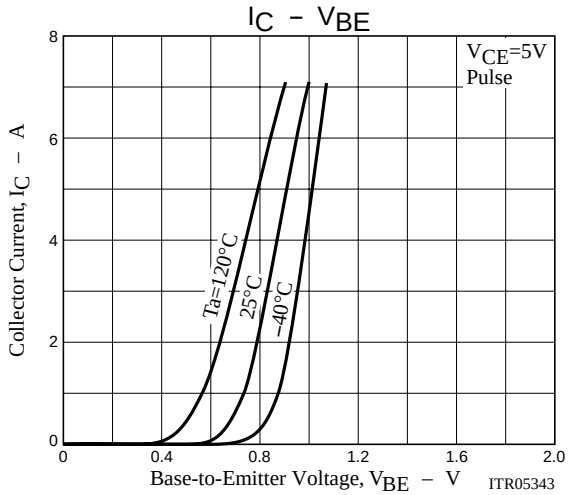
Continued from preceding page.

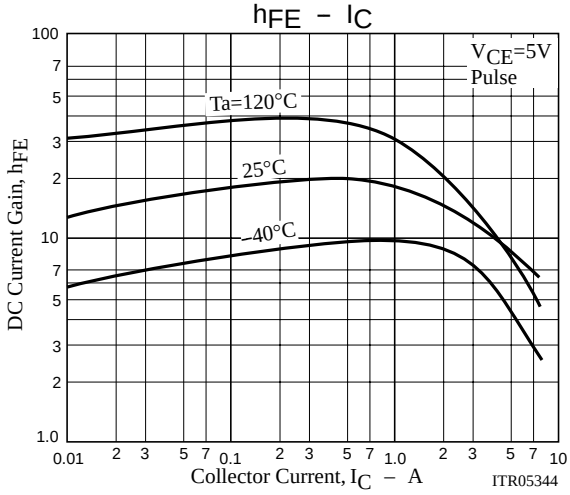
| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| Collector-to-Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C$=3A, $I_B$=0.6A | | | 1.0 | V |
| Base-to-Emitter Saturation Voltage | $V_{BE(sat)}$ | $I_C$=3A, $I_B$=0.6A | | | 1.5 | V |
| Gain-Bandwidth Product | $f_T$ | $V_{CE}$=10V, $I_C$=0.6A | | 18 | | MHz |
| Output Capacitance | $C_{ob}$ | $V_{CB}$=10V, f=1MHz | | 80 | | pF |
| Collector-to-Base Breakdown Voltage | $V_{(BR)CBO}$ | $I_C$=1mA, $I_E$=0 | 800 | | | V |
| Collector-to-Emitter Breakdown Voltage | $V_{(BR)CEO}$ | $I_C$=5mA, $R_{BE}$=∞ | 500 | | | V |
| Emitter-to-Base Breakdown Voltage | $V_{(BR)EBO}$ | $I_E$=1mA, $I_C$=0 | 7 | | | V |
| Collector-to-Emitter Sustain Voltage | $V_{CEO(sus)}$ | $I_C$=7A, $I_B$=0.14A, L=50μH | 500 | | | V |
| Collector-to-Emitter Sustain Voltage | $V_{CEX(sus)1}$ | $I_C$=7A, $I_{B1}$=0.14A, L=200μH, $I_{B2}$=–0.14A, clamped | 500 | | | V |
| | $V_{CEX(sus)2}$ | $I_C$=1.2A, $I_{B1}$=0.24A, L=200μH, $I_{B2}$=–0.24A, clamped | 550 | | | V |
| Turn-ON Time | $t_{on}$ | $I_C$=4A, $I_{B1}$=0.8A, $I_{B2}$=–0.8A, $R_L$=50Ω, $V_{CC}$=200V | | | 1.0 | μs |
| Storage Time | $t_{stg}$ | $I_C$=4A, $I_{B1}$=0.8A, $I_{B2}$=–0.8A, $R_L$=50Ω, $V_{CC}$=200V | | | 3.0 | μs |
| Fall Time | $t_f$ | $I_C$=4A, $I_{B1}$=0.8A, $I_{B2}$=–0.8A, $R_L$=50Ω, $V_{CC}$=200V | | | 1.0 | μs |

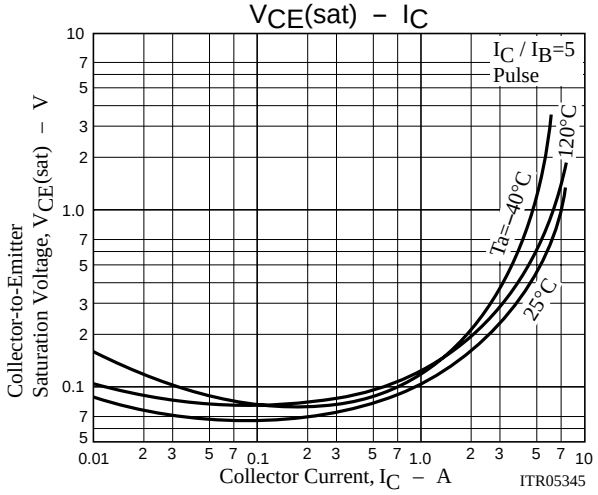
## Switching Time Test Circuit

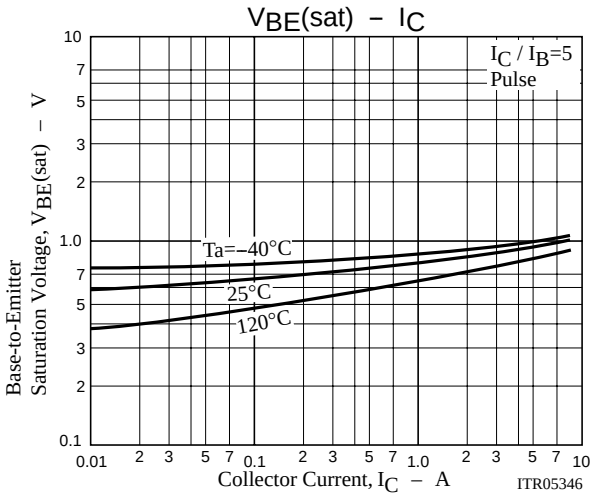


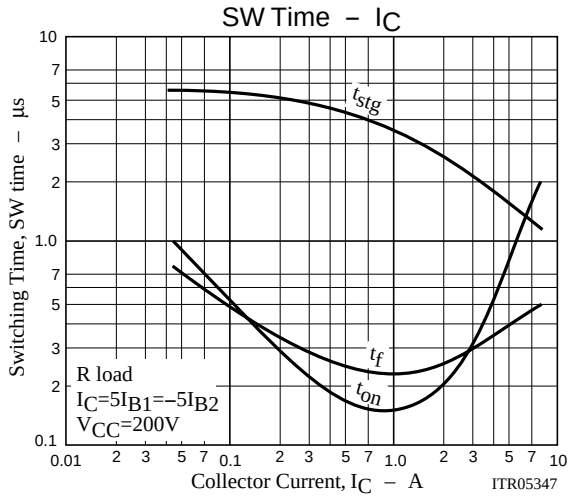



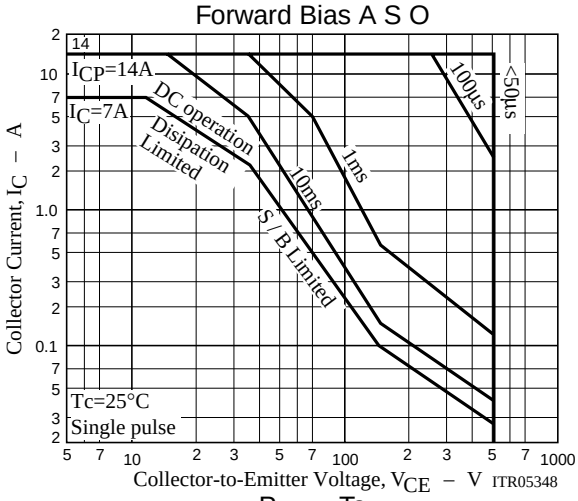



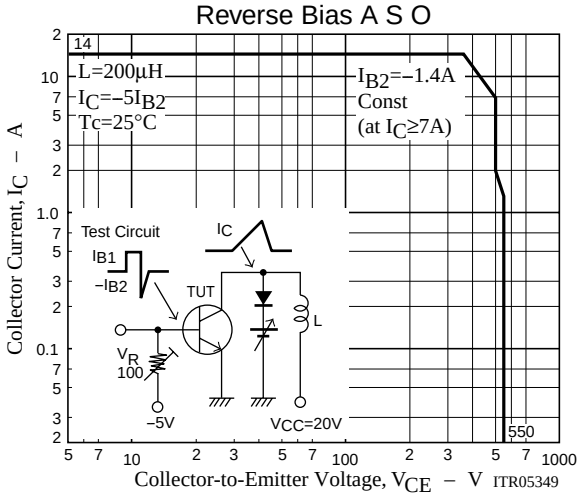



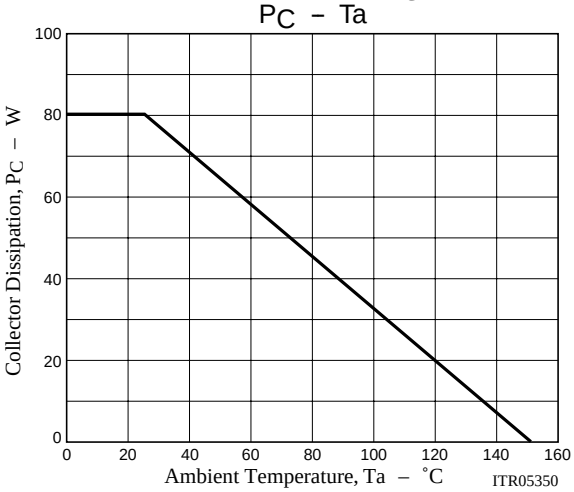




VBE(sat) – IC
IC / IB=5
Pulse
Ta=–40°C
25°C
120°C
Base-to-Emitter Saturation Voltage, VBE(sat) – V
Collector Current, IC – A
ITR05346


SW Time – IC
tstg
tf
ton
R load
IC=5IB1=–5IB2
VCC=200V
Switching Time, SW time – µs
Collector Current, IC – A
ITR05347


Forward Bias A S O
14
ICP=14A
IC=7A
DC operation
Disipation Limited
100µs
<50µs
1ms
10ms
S / B Limited
Tc=25°C
Single pulse
Collector Current, IC – A
Collector-to-Emitter Voltage, VCE – V
ITR05348


Reverse Bias A S O
14
L=200µH
IC=–5IB2
Tc=25°C
IB2=–1.4A
Const
(at IC≥7A)
Test Circuit
IC
IB1
–IB2
TUT
L
VR
100
–5V
VCC=20V
550
Collector Current, IC – A
Collector-to-Emitter Voltage, VCE – V
ITR05349


PC – Ta
Collector Dissipation, PC – W
Ambient Temperature, Ta – °C
ITR05350