Ordering number : ENN7610

NPN Triple Diffused Planar Silicon Transistor

# 2SC5960

## Switching Regulator Applications

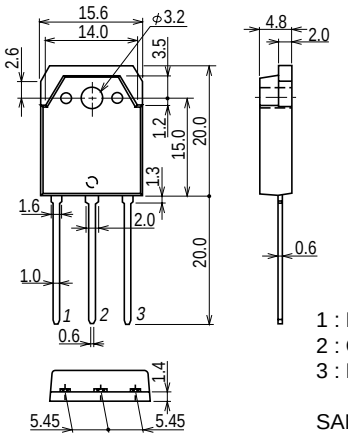
### Features

- High breakdown voltage and high reliability.
- High-speed switching.
- Wide ASO.
- Adoption of MBIT process.

### Package Dimensions

unit : mm
2022A

[2SC5960]




1 : Base
2 : Collector
3 : Emitter

SANYO : TO-3PB

### Specifications

**Absolute Maximum Ratings** at Ta=25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Collector-to-Base Voltage | $V_{CBO}$ | | 500 | V |
| Collector-to-Emitter Voltage | $V_{CEO}$ | | 400 | 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 | 60 | 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 | $I_{CBO}$ | $V_{CB}$=400V, $I_E$=0 | | | 10 | μA |
| Emitter Cutoff Current | $I_{EBO}$ | $V_{EB}$=5V, $I_C$=0 | | | 10 | μA |

Continued on next page.



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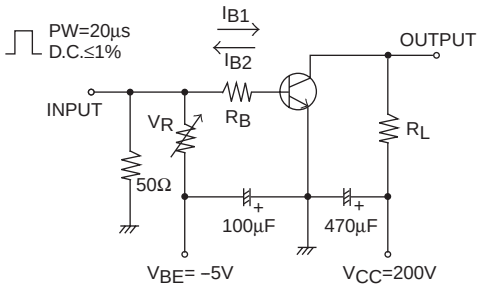
Continued from preceding page.

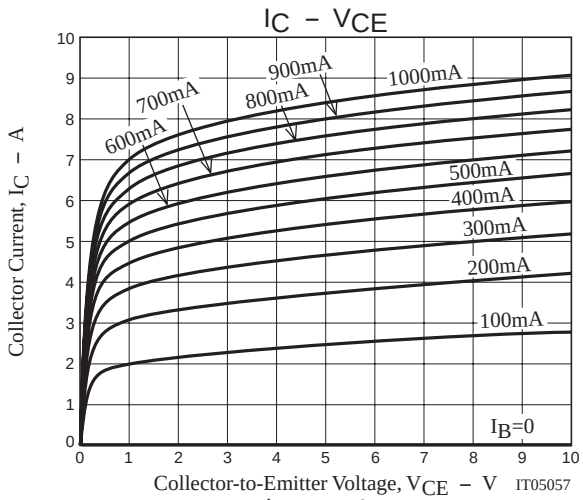
| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| DC Current Gain | $h_{FE}1$ | $V_{CE}$=5V, $I_C$=0.8A | 20* | | 50* | |
| | $h_{FE}2$ | $V_{CE}$=5V, $I_C$=4A | 10 | | | |
| | $h_{FE}3$ | $V_{CE}$=5V, $I_C$=1mA | 10 | | | |
| Collector-to-Emitter Saturation Voltage | $V_{CE}$(sat) | $I_C$=4A, $I_B$=0.8A | | | 0.8 | V |
| Base-to-Emitter Saturation Voltage | $V_{BE}$(sat) | $I_C$=4A, $I_B$=0.8A | | | 1.5 | V |
| Gain-Bandwidth Product | $f_T$ | $V_{CE}$=10V, $I_C$=0.8A | | 15 | | MHz |
| Output Capacitance | Cob | $V_{CB}$=10V, f=1MHz | | 50 | | pF |
| Collector-to-Base Breakdown Voltage | $V_{(BR)CBO}$ | $I_C$=1mA, $I_E$=0 | 500 | | | V |
| Collector-to-Emitter Breakdown Voltage | $V_{(BR)CEO}$ | $I_C$=5mA, $R_{BE}$=∞ | 400 | | | V |
| Emitter-to-Base Breakdown Voltage | $V_{(BR)EBO}$ | $I_E$=1mA, $I_C$=0 | 7 | | | V |
| Turn-On Time | $t_{on}$ | $I_C$=5A, $I_{B1}$=1A, $I_{B2}$=-2A, $R_L$=40Ω, $V_{CC}$=200V | | | 0.5 | μs |
| Storage Time | $t_{stg}$ | $I_C$=5A, $I_{B1}$=1A, $I_{B2}$=-2A, $R_L$=40Ω, $V_{CC}$=200V | | | 2.5 | μs |
| Fall Time | $t_f$ | $I_C$=5A, $I_{B1}$=1A, $I_{B2}$=-2A, $R_L$=40Ω, $V_{CC}$=200V | | | 0.3 | μs |

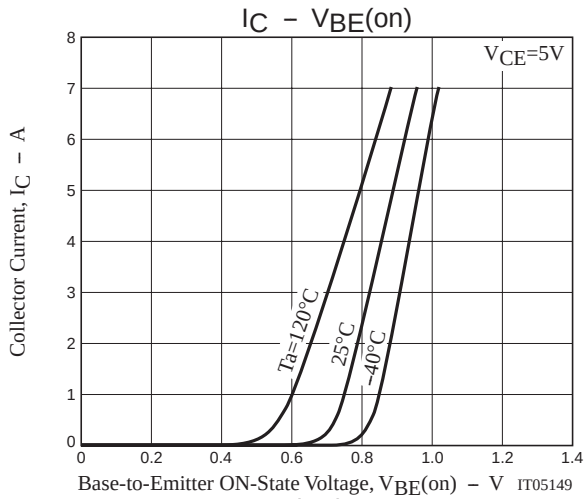
* : The $h_{FE}1$ of the 2SC5960 is classified as follows.

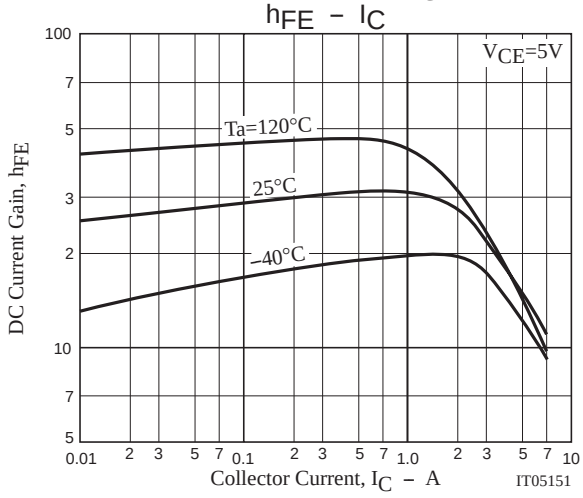
| Rank | M | N |
|---|---|---|
| $h_{FE}$ | 20 to 40 | 30 to 50 |

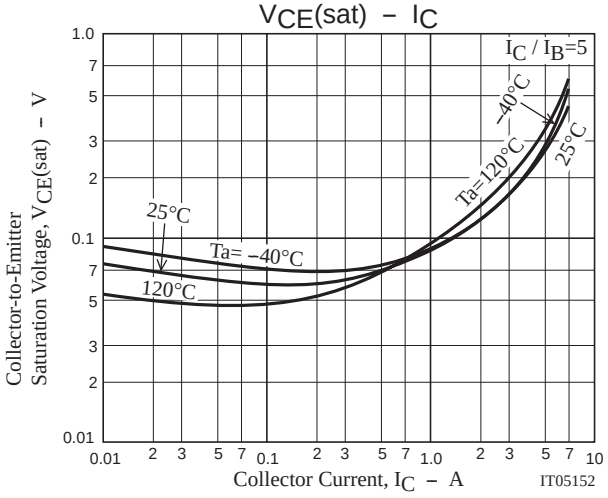
## Switching Time Test Circuit

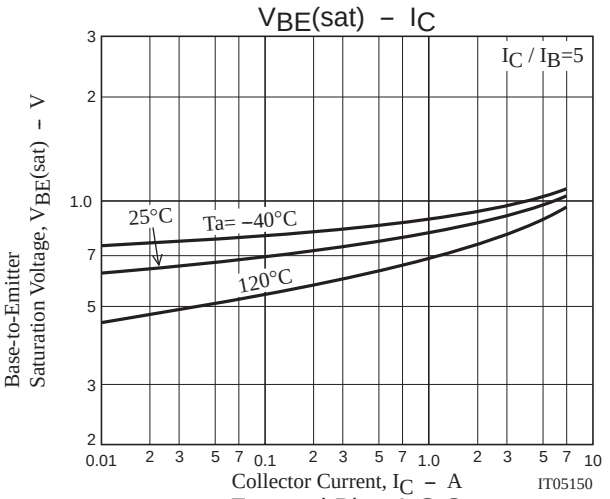


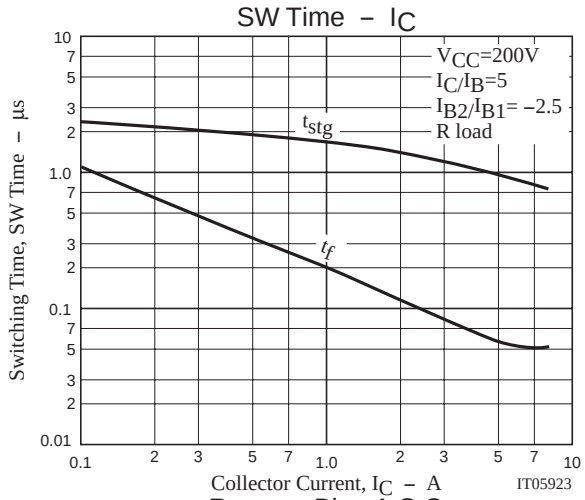



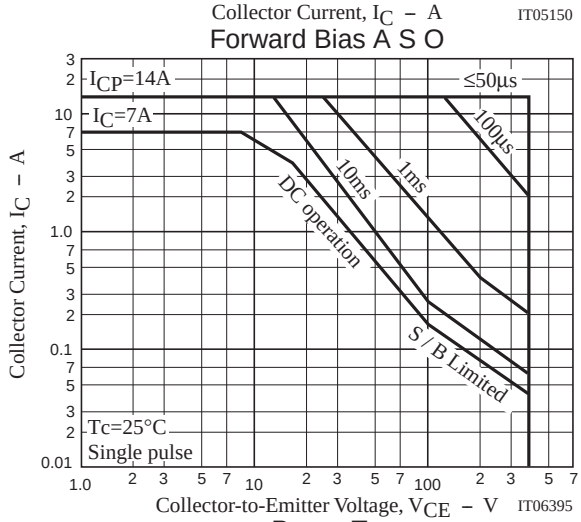



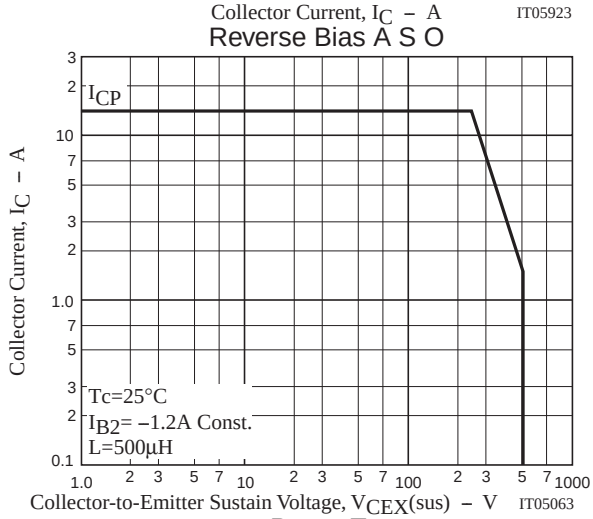



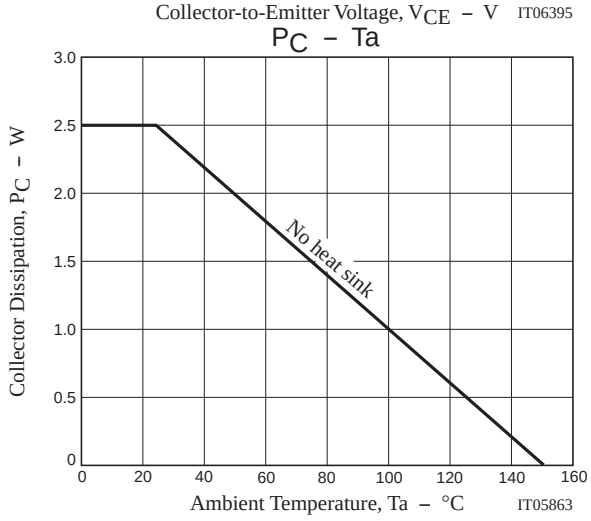



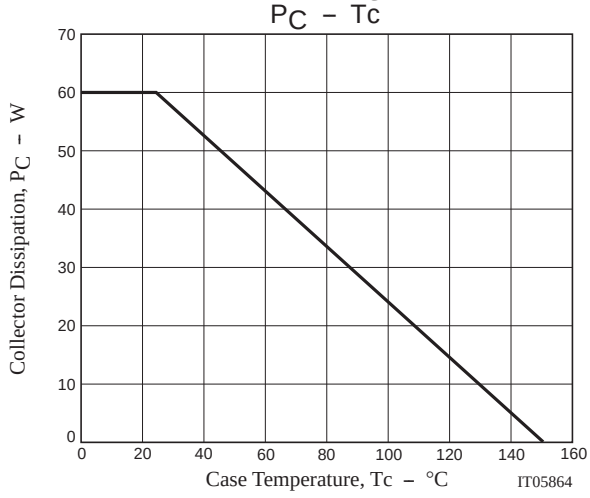

VBE(sat) – IC
IC / IB=5
25°C
Ta= –40°C
120°C
Base-to-Emitter Saturation Voltage, VBE(sat) – V
Collector Current, IC – A
IT05150


SW Time – IC
VCC=200V
IC/IB=5
IB2/IB1= –2.5
R load
tstg
tf
Switching Time, SW Time – µs
Collector Current, IC – A
IT05923


Forward Bias A S O
ICP=14A
IC=7A
≤50µs
100µs
1ms
10ms
DC operation
S / B Limited
Tc=25°C
Single pulse
Collector Current, IC – A
Collector-to-Emitter Voltage, VCE – V
IT06395


Reverse Bias A S O
ICP
Tc=25°C
IB2= –1.2A Const.
L=500µH
Collector Current, IC – A
Collector-to-Emitter Sustain Voltage, VCEX(sus) – V
IT05063


PC – Ta
No heat sink
Collector Dissipation, PC – W
Ambient Temperature, Ta – °C
IT05863


PC – Tc
Collector Dissipation, PC – W
Case Temperature, Tc – °C
IT05864