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Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
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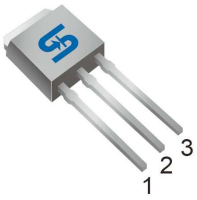
TAIWAN SEMICONDUCTOR

RoHS COMPLIANCE

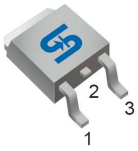
# TSC5303D

## High Voltage NPN Transistor with Diode

**TO-251 (IPAK)**




**TO-252 (DPAK)**




**Pin Definition:**
1. Base
2. Collector
3. Emitter

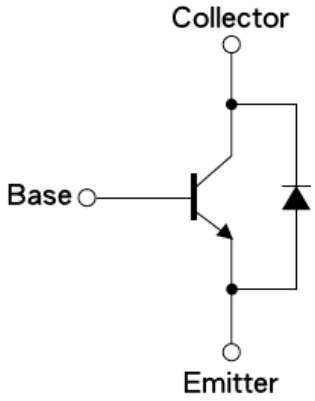
### PRODUCT SUMMARY

| | |
|---|---|
| $BV_{CEO}$ | 400V |
| $BV_{CBO}$ | 700V |
| $I_C$ | 3A |
| $V_{CE(SAT)}$ | 0.17V @ $I_C$=1A, $I_B$=0.25A |

### Features

- Build-in Free-wheeling Diode Makes Efficient Anti-saturation Operation
- No Need to Interest an $h_{FE}$ Value Because of Low Variable Storage-time Spread Even Though Comer Spirit Product.
- Low Base Drive Requirement
- Suitable for Half Bridge Light Ballast Application

### Block Diagram




### Structure

- Silicon Triple Diffused Type
- NPN Silicon Transistor
- Integrated Anti-parallel Collector-Emitter Diode

### Ordering Information

| Part No. | Package | Packing |
|---|---|---|
| TSC5303DCP ROG | TO-252 | 2.5kpcs / 13” Reel |
| TSC5303DCH C5G | TO-251 | 75pcs / Tube |

**Note:** “G” denotes Halogen Free Products

### Absolute Maximum Ratings (Ta = 25°C unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | 700 | V |
| Collector-Emitter Voltage @ $V_{BE}$=0V | $V_{CES}$ | 700 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | 400 | V |
| Emitter-Base Voltage | $V_{EBO}$ | 9 | V |
| Collector Current | $I_C$ | 3 | A |
| Collector Peak Current (tp <5ms) | $I_{CM}$ | 6 | A |
| Base Current | $I_B$ | 1.5 | A |
| Base Peak Current (tp <5ms) | $I_{BM}$ | 3 | A |
| Power Total Dissipation @ $T_C$=25ºC | $P_{DTOT}$ | 30 | W |
| Maximum Operating Junction Temperature | $T_J$ | +150 | °C |
| Storage Temperature Range | $T_{STG}$ | -55 to +150 | °C |

# TSC5303D

High Voltage NPN Transistor with Diode

## Thermal Performance

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Thermal Resistance - Junction to Case | $R\Theta_{JC}$ | 4.15 | °C/W |
| Thermal Resistance - Junction to Ambient | $R\Theta_{JA}$ | 75 | °C/W |

## Electrical Specifications (Ta = 25°C unless otherwise noted)

| Parameter | Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Static** | | | | | | |
| Collector-Base Voltage | $I_C$ =1mA, $I_B$ =0 | $BV_{CBO}$ | 700 | -- | -- | V |
| Collector-Emitter Breakdown Voltage | $I_C$ =10mA, $I_E$ =0 | $BV_{CEO}$ | 400 | -- | -- | V |
| Emitter-Base Breakdown Voltage | $I_E$ =1mA, $I_C$ =0 | $BV_{EBO}$ | 9 | -- | -- | V |
| Collector Cutoff Current | $V_{CB}$ =700V, $I_E$ =0 | $I_{CBO}$ | -- | -- | 10 | μA |
| Collector Cutoff Current | $V_{CE}$ =400V, $I_B$ =0 | $I_{CEO}$ | -- | -- | 10 | μA |
| Emitter Cutoff Current | $V_{EB}$ =7V, $I_C$ =0 | $I_{EBO}$ | -- | -- | 10 | μA |
| Collector-Emitter Saturation Voltage | $I_C$ =0.4A, $I_B$ =0.1A | $V_{CE(SAT)1}$ | -- | 0.10 | 0.7 | V |
| | $I_C$ =1A, $I_B$ =0.25A | $V_{CE(SAT)2}$ | -- | 0.17 | 1 | |
| | $I_C$ =2A, $I_B$ =0.5A | $V_{CE(SAT)3}$ | -- | 0.55 | -- | |
| Base-Emitter Saturation Voltage | $I_C$ =1A, $I_B$ =0.25A | $V_{BE(SAT)1}$ | -- | -- | 1.1 | V |
| | $I_C$ =2A, $I_B$ =0.5A | $V_{BE(SAT)2}$ | -- | -- | 1.2 | |
| DC Current Gain | $V_{CE}$ =5V, $I_C$ =10mA | $h_{FE}$ | 10 | -- | -- | |
| | $V_{CE}$ =5V, $I_C$ =1A | | 15 | -- | 30 | |
| | $V_{CE}$ =5V, $I_C$ =2A | | 5 | -- | -- | |
| Forward Voltage Drop | $I_F$ =2A | Vf | -- | -- | 2 | V |
| Turn On Time | $V_{CC}$ =250V, $I_C$ =1A, $I_{B1}$=$I_{B2}$=0.2A, $t_p$=25μs Duty Cycle<1% | $t_{ON}$ | -- | 0.2 | 0.6 | μs |
| Storage Time | | $t_{STG}$ | -- | 2.7 | 4.5 | μs |
| Fall Time | | $t_f$ | -- | 0.16 | 0.3 | μs |

**Note:** Pulsed duration =380μs, duty cycle ≤2%

# TSC5303D

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## Electrical Characteristics Curve (Ta = 25°C, unless otherwise noted)

**Figure 1. Static Characteristics**

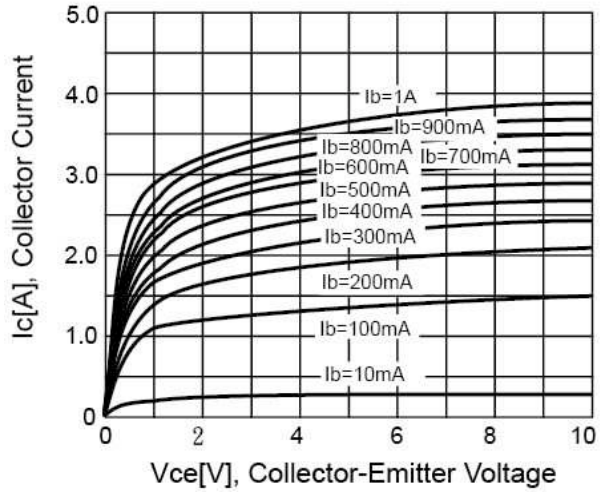



**Figure 2. DC Current Gain**

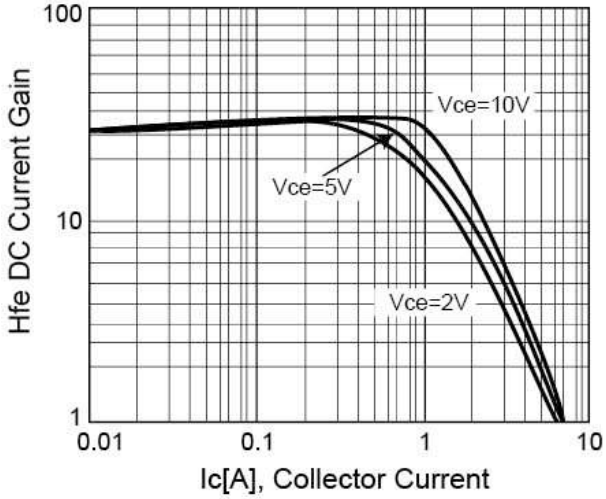



**Figure 3. Vce(sat) v.s. Vbe(sat)**

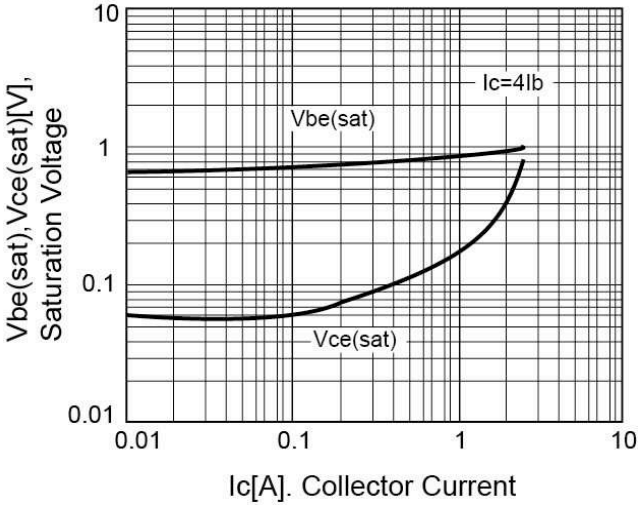



**Figure 4. Power Derating**

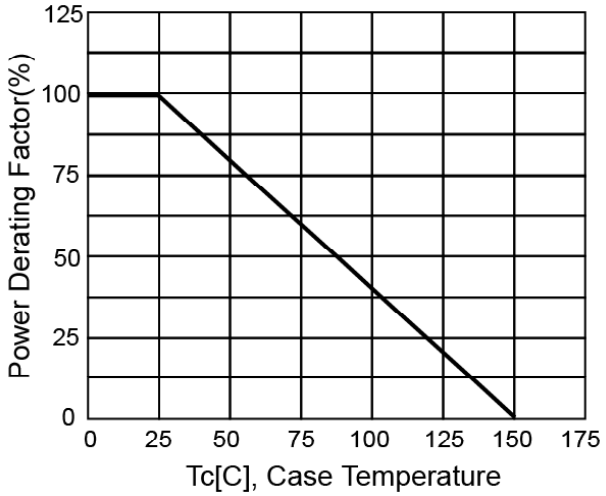



**Figure 5. Reverse Bias SOA**

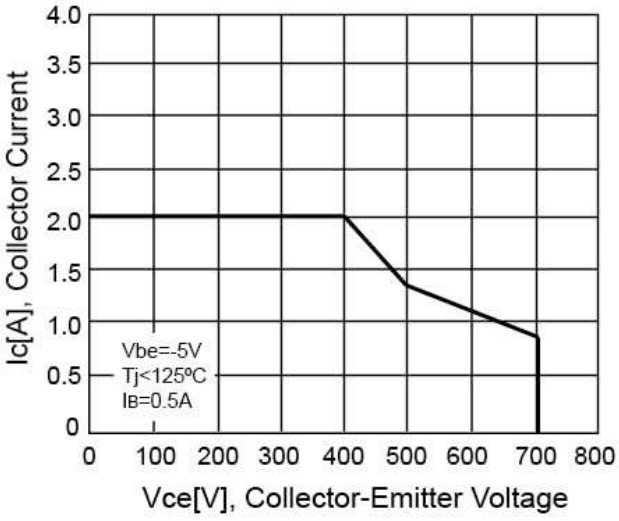
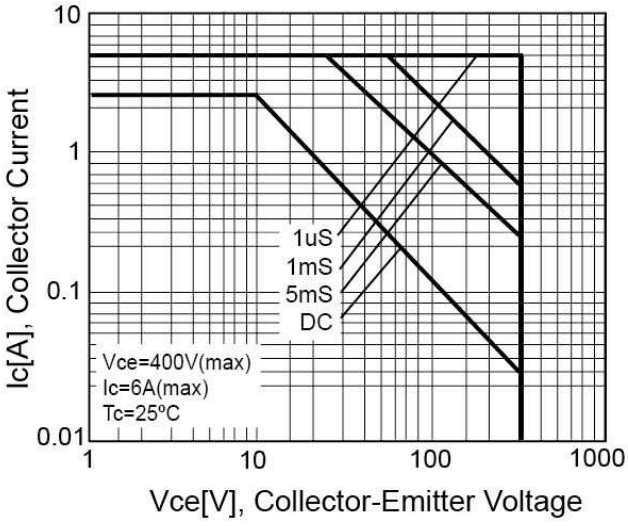



**Figure 6. Safety Operating Area**



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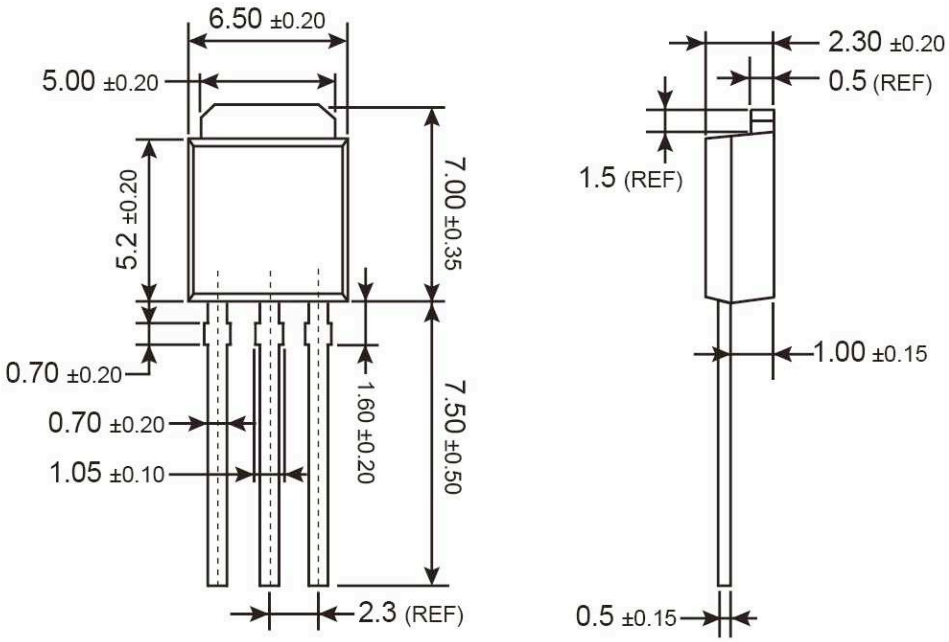
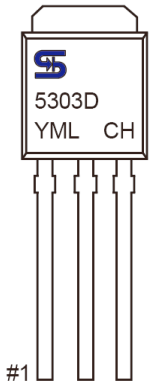
High Voltage NPN Transistor with Diode

## TO-251 Mechanical Drawing




Unit: Millimeters

## Marking Diagram




**Y** = Year Code
**M** = Month Code for Halogen Free Product
(**O**=Jan, **P**=Feb, **Q**=Mar, **R**=Apl, **S**=May, **T**=Jun, **U**=Jul, **V**=Aug, **W**=Sep, **X**=Oct, **Y**=Nov, **Z**=Dec)
**L** = Lot Code

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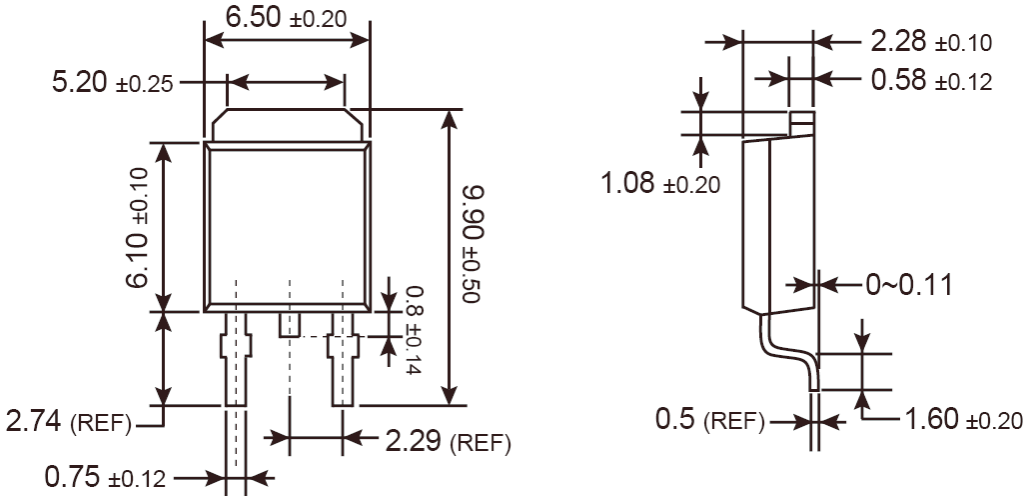
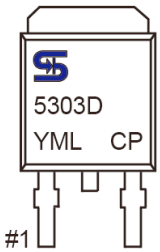
High Voltage NPN Transistor with Diode

## TO-252 Mechanical Drawing




Unit: Millimeters

## Marking Diagram

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