# TSC5302D

## High Voltage NPN Transistor with Diode



Pin assignment:
1. Base
2. Collector
3. Emitter

**$BV_{CEO}$ = 400V**
**$BV_{CBO}$ = 800V**
**Ic = 2A**
**$V_{CE\ (SAT)}$, = 1.0V @ Ic / Ib = 1A / 0.2A**

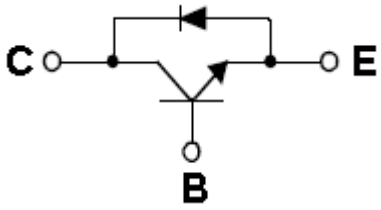
### Features

- ✧ Built-in free-wheeling diode makes efficient anti saturation operation.
- ✧ No need to interest an hfe value because of low variable storage-time spread even though comer spirit product.
- ✧ Low base drive requirement.
- ✧ Suitable for half bridge light ballast applications.

### Ordering Information

| Part No. | Packing | Package |
|---|---|---|
| TSC5302DCH | Tube | TO-251 |
| TSC5302DCP | T&R | TO-252 |

### Block Diagram




### Structure

- ✧ Silicon triple diffused type.
- ✧ NPN silicon transistor with Diode

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

| Parameter | | Symbol | Limit | Unit |
|---|---|---|---|---|
| Collector-Base Voltage | | $V_{CBO}$ | 800V | V |
| Collector-Emitter Voltage | | $V_{CEO}$ | 400V | V |
| Emitter-Base Voltage | | $V_{EBO}$ | 10 | V |
| Collector Current | DC | $I_C$ | 2 | A |
| | Pulse | | 4 | |
| Base Current | DC | $I_B$ | 1 | A |
| | Pulse | | 2 | |
| Collector Power Dissipation (Tc=25 °C) | TO-251 | $P_D$ | 75 | W |
| | TO-252 | | 1.5 | |
| Operating Junction Temperature | | $T_J$ | +150 | °C |
| Operating Junction and Storage Temperature Range | | $T_{STG}$ | - 65 to +150 | °C |
| Thermal Resistance Junction to Case | | RΘjc | 6.25 | °C/W |
| Thermal Resistance Junction to Ambient | | RΘja | 100 | °C/W |

Note: 1. Single pulse, Pw = 300uS, Duty <= 2%

## Electrical Characteristics

| Parameter | Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Static** | | | | | | |
| Collector-Base Voltage | $I_C$ = 1mA, $I_B$ = 0 | $BV_{CBO}$ | 800 | -- | -- | V |
| Collector-Emitter Breakdown Voltage | $I_C$ = 5mA, $I_E$ = 0 | $BV_{CEO}$ | 400 | -- | -- | V |
| Emitter-Base Breakdown Voltage | $I_E$ = 1mA, $I_C$ = 0 | $BV_{EBO}$ | 10 | -- | -- | V |
| Collector Cutoff Current | $V_{CB}$ = 500V, $I_E$ = 0 | $I_{CBO}$ | -- | -- | 10 | uA |
| Emitter Cutoff Current | $V_{EB}$ = 9V, $I_C$ = 0 | $I_{EBO}$ | -- | -- | 10 | uA |
| Collector-Emitter Saturation Voltage | $I_C$ / $I_B$ = 0.5A / 0.1A<br>$I_C$ / $I_B$ = 1.0A / 0.25A | $V_{CE(SAT)}1$<br>$V_{CE(SAT)}2$ | --<br>-- | --<br>-- | 0.4<br>0.6 | V |
| Base-Emitter Saturation Voltage | $I_C$ / $I_B$ = 0.5A / 0.1A<br>$I_C$ / $I_B$ = 1.0A / 0.25A | $V_{CB(SAT)}1$<br>$V_{CB(SAT)}2$ | --<br>-- | --<br>-- | 0.9<br>1.0 | V |
| DC Current Gain | $V_{CE}$ = 5V, $I_C$ = 0.4A<br>$V_{CE}$ = 5V, $I_C$ = 1A | $h_{FE}$ 1<br>$h_{FE}$ 2 | 20<br>6 | --<br>-- | --<br>-- | |
| Turn On Time | $V_{CC}$ = 250V, $I_C$ = 1A, | $t_{ON}$ | -- | -- | 0.5 | uS |
| Storage Time | $I_{B1}$ = $I_{B2}$ = 0.2A, tp= 25uS | $t_{STG}$ | -- | 2.0 | 2.75 | uS |
| Fall Time | Duty cycle < 1% | $t_F$ | -- | -- | 0.2 | uS |
| **Doide** | | | | | | |
| Fall Time | $I_C$ = 1A | $t_F$ | -- | -- | 700 | nS |
| Forward Voltage | $I_C$ = 1A | Vf | -- | -- | 1.4 | V |

Note : pulse test: pulse width <=300uS, duty cycle <=2%

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## Electrical Characteristics Curve

**Figure 1. Static Characteric**

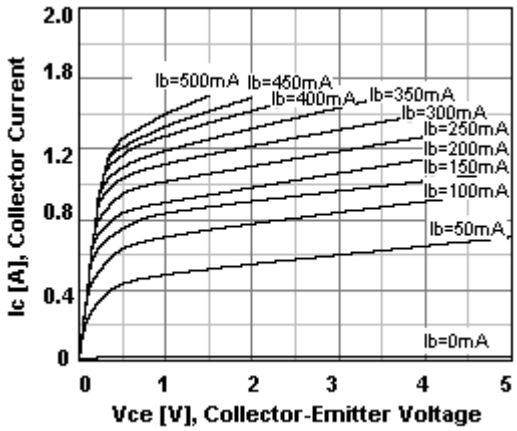



**Figure 2. DC Current Gain**

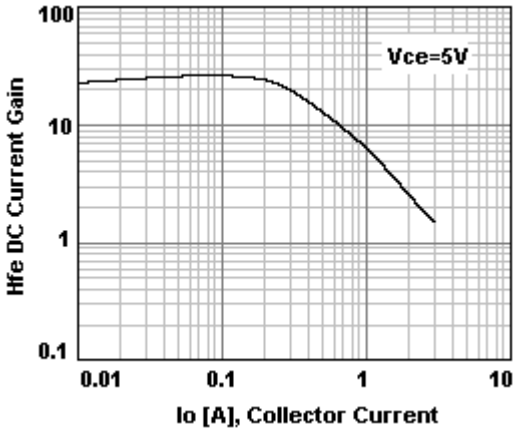



**Figure 3. Vce(sat) v.s. Vbe(sat)**

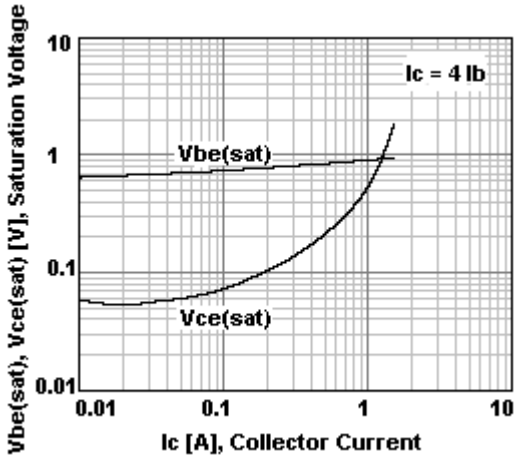



**Figure 4. Switching Time**

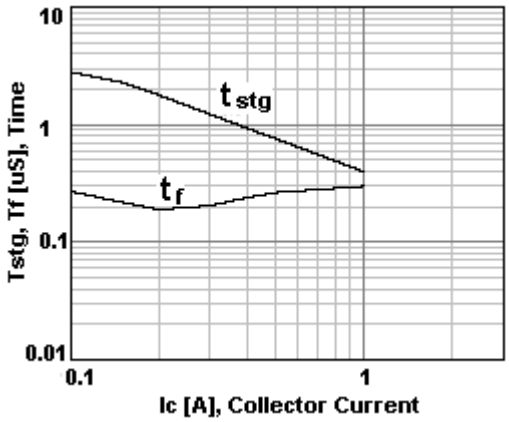



**Figure 5. Safe Operating Area**

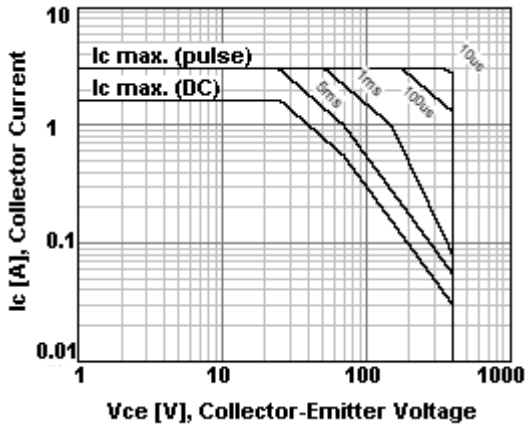
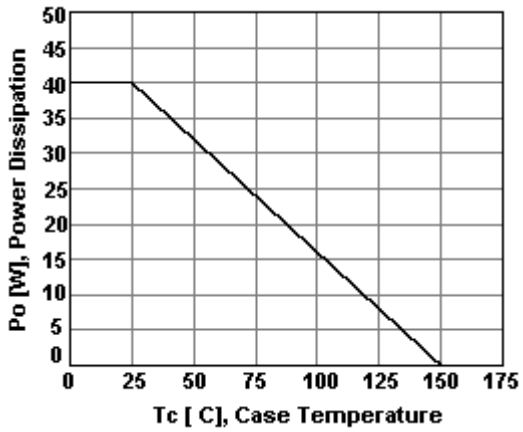



**Figure 6. Power Derating**



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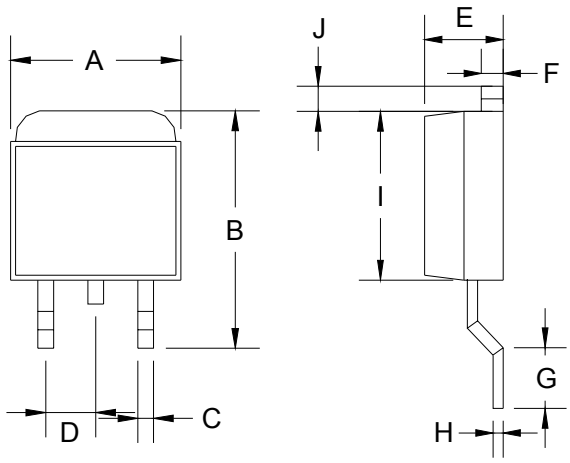
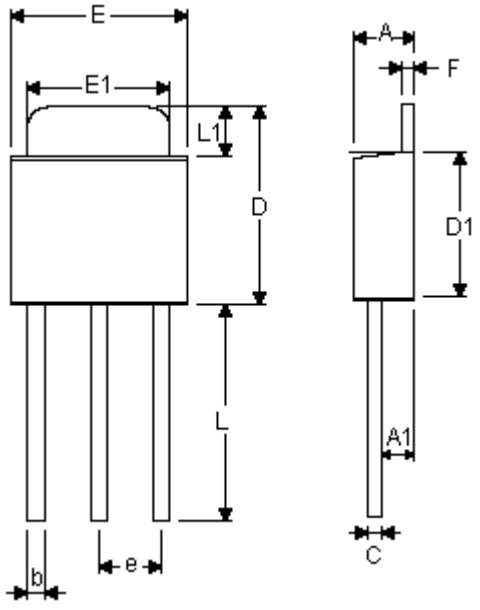
## TO-252 Mechanical Drawing




| TO-252 DIMENSION | | | | |
|---|---|---|---|---|
| DIM | MILLIMETERS | | INCHES | |
| | MIN | MAX | MIN | MAX |
| A | 6.570 | 6.840 | 0.259 | 0.269 |
| B | 9.250 | 10.400 | 0.364 | 0.409 |
| C | 0.550 | 0.700 | 0.022 | 0.028 |
| D | 2.560 | 2.670 | 0.101 | 0.105 |
| E | 2.300 | 2.390 | 0.090 | 0.094 |
| F | 0.490 | 0.570 | 0.019 | 0.022 |
| G | 1.460 | 1.580 | 0.057 | 0.062 |
| H | 0.520 | 0.570 | 0.020 | 0.022 |
| I | 5.340 | 5.550 | 0.210 | 0.219 |
| J | 1.460 | 1.640 | 0.057 | 0.065 |

## TO-251 Mechanical Drawing




| TO-251 DIMENSION | | | | |
|---|---|---|---|---|
| DIM | MILLIMETERS | | INCHES | |
| | MIN | MAX | MIN | MAX |
| A | 2.20 | 2.4 | 0.087 | 0.095 |
| A1 | 1.10 | 1.30 | 0.043 | 0.051 |
| b | 0.40 | 0.80 | 0.016 | 0.032 |
| C | 0.40 | 0.60 | 0.016 | 0.024 |
| D | 6.70 | 7.30 | 0.264 | 0.287 |
| D1 | 5.40 | 5.65 | 0.213 | 0.222 |
| E | 6.40 | 6.65 | 0.252 | 0.262 |
| e | 2.10 | 2.50 | 0.083 | 0.098 |
| F | 0.40 | 0.60 | 0.016 | 0.024 |
| L | 7.00 | 8.00 | 0.276 | 0.315 |
| L1 | 1.60 | 1.86 | 0.063 | 0.073 |