



# TS13005

## High Voltage NPN Transistor

**TO-220****ITO-220****TO-252**

Pin assignment:

1. Base
2. Collector
3. Emitter

 **$BV_{CEO} = 400V$**  **$BV_{CBO} = 700V$**  **$I_C = 4A$**  **$V_{CE(SAT)} = 1V @ I_C / I_B = 4A / 1A$** 

### Features

- ✧ High voltage.
- ✧ High speed switching

### Structure

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

### Ordering Information

| Part No.  | Packing | Package |
|-----------|---------|---------|
| TS13005CZ | Tube    | TO-220  |
| TS13005CI |         | ITO-220 |
| TS13005CP | T&R     | TO-252  |

### Absolute Maximum Rating ( $T_a = 25^\circ C$ unless otherwise noted)

| Parameter                                        | Symbol    | Limit        | Unit       |
|--------------------------------------------------|-----------|--------------|------------|
| Collector-Base Voltage                           | $V_{CBO}$ | 700V         | V          |
| Collector-Emitter Voltage                        | $V_{CEO}$ | 400V         | V          |
| Emitter-Base Voltage                             | $V_{EBO}$ | 9            | V          |
| Collector Current                                | DC        | $I_C$        | A          |
|                                                  | Pulse     | 8            |            |
| Collector Power Dissipation                      | TO-220    | $P_D$        | W          |
|                                                  | ITO-220   | 1.5          |            |
|                                                  | TO-252    | 1.3          |            |
| Operating Junction Temperature                   | $T_J$     | +150         | $^\circ C$ |
| Operating Junction and Storage Temperature Range | $T_{STG}$ | - 65 to +150 | $^\circ C$ |

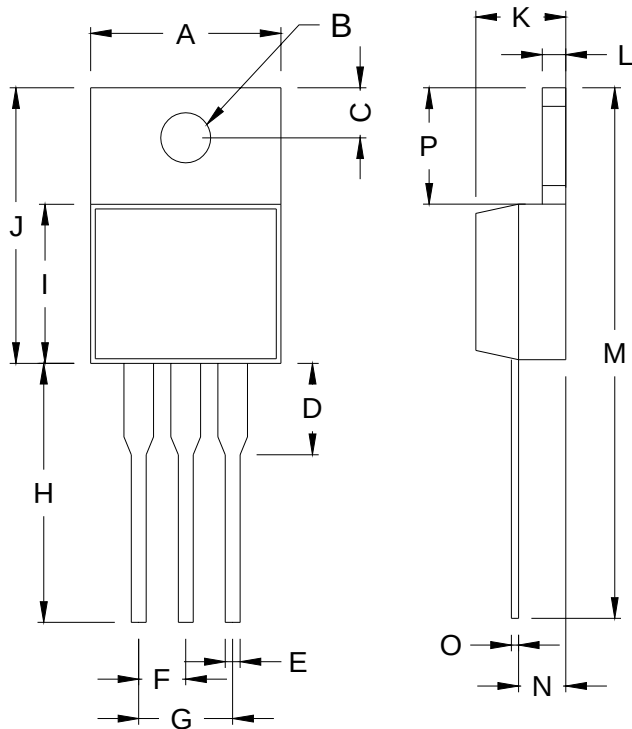
Note: 1. Single pulse,  $P_w = 300\mu S$ , Duty  $\leq 2\%$ 

### Electrical Characteristics ( $T_a = 25^\circ C$ unless otherwise noted)

| Parameter                            | Conditions                        | Symbol         | Min | Typ | Max | Unit    |
|--------------------------------------|-----------------------------------|----------------|-----|-----|-----|---------|
| <b>Static</b>                        |                                   |                |     |     |     |         |
| Collector-Base Voltage               | $I_C = 10mA, I_B = 0$             | $BV_{CBO}$     | 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  | mA      |
| Emitter Cutoff Current               | $V_{EB} = 9V, I_C = 0$            | $I_{EBO}$      |     |     | 1   | mA      |
| Collector-Emitter Saturation Voltage | $I_C / I_B = 4A / 1A$             | $V_{CE(SAT)1}$ |     |     | 1   | V       |
|                                      | $I_C / I_B = 1A / 0.2A$           | $V_{CE(SAT)2}$ |     |     | 0.5 | V       |
| DC Current Gain                      | $V_{CE} = 5V, I_C = 2A$           | $h_{FE}$       | 8   |     | 40  |         |
| Frequency                            | $V_{CE} = 10V, I_C = 0.5A$        | $f_T$          | 4   |     |     | MHz     |
| Output Capacitance                   | $V_{CB} = 10V, f = 0.1MHz$        | $C_{ob}$       |     | 65  |     | pF      |
| Turn On Time                         | $V_{CC} = 125V, I_C = 2A,$        | $t_{ON}$       |     | 0.8 |     | $\mu S$ |
| Storage Time                         | $I_{B1} = 0.4A, I_{B2} = - 0.4A,$ | $t_{STG}$      |     |     | 4   | $\mu S$ |
| Fall Time                            | $R_L = 62.5\Omega$                | $t_f$          |     |     | 0.9 | $\mu S$ |

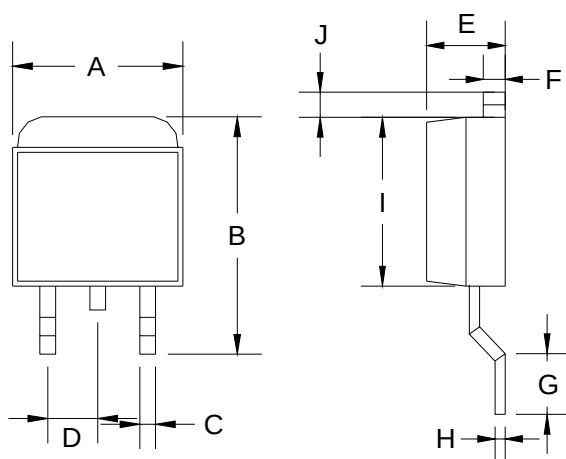
Note : pulse test: pulse width  $\leq 300\mu S$ , duty cycle  $\leq 2\%$

## TO-220 Mechanical Drawing



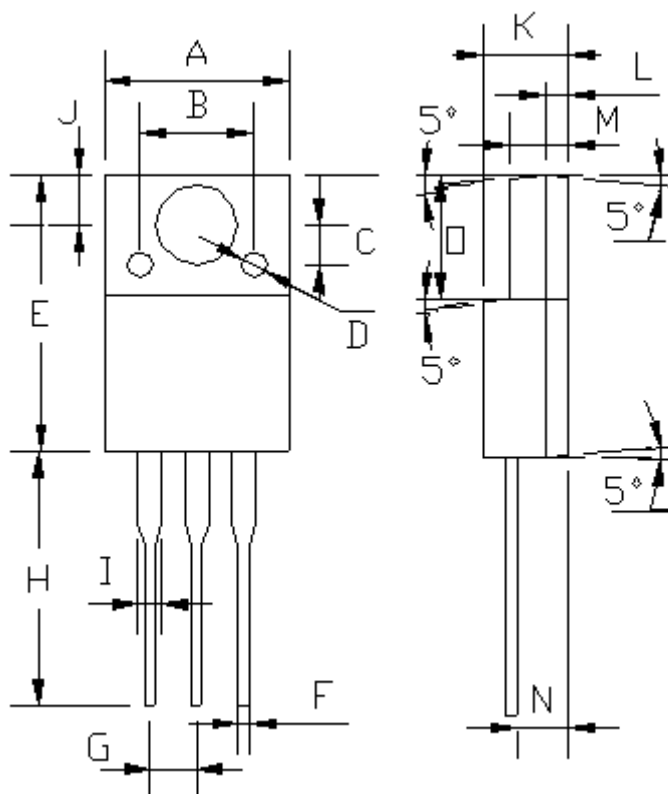
| TO-220 DIMENSION |             |        |        |       |
|------------------|-------------|--------|--------|-------|
| DIM              | MILLIMETERS |        | INCHES |       |
|                  | MIN         | MAX    | MIN    | MAX   |
| A                | 10.000      | 10.500 | 0.394  | 0.413 |
| B                | 3.240       | 4.440  | 0.128  | 0.175 |
| C                | 2.440       | 2.940  | 0.096  | 0.116 |
| D                | -           | 6.350  | -      | 0.250 |
| E                | 0.381       | 1.106  | 0.015  | 0.040 |
| F                | 2.345       | 2.715  | 0.092  | 0.058 |
| G                | 4.690       | 5.430  | 0.092  | 0.107 |
| H                | 12.700      | 14.732 | 0.500  | 0.581 |
| I                | 8.382       | 9.017  | 0.330  | 0.355 |
| J                | 14.224      | 16.510 | 0.560  | 0.650 |
| K                | 3.556       | 4.826  | 0.140  | 0.190 |
| L                | 0.508       | 1.397  | 0.020  | 0.055 |
| M                | 27.700      | 29.620 | 1.060  | 1.230 |
| N                | 2.032       | 2.921  | 0.080  | 0.115 |
| O                | 0.255       | 0.610  | 0.010  | 0.024 |
| P                | 5.842       | 6.858  | 0.230  | 0.270 |

## 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 |

## ITO-220 Mechanical Drawing



| ITO-220 DIMENSION |               |       |                |       |
|-------------------|---------------|-------|----------------|-------|
| DIM               | MILLIMETERS   |       | INCHES         |       |
|                   | MIN           | MAX   | MIN            | MAX   |
| A                 | 10.04         | 10.07 | 0.395          | 0.396 |
| B                 | 6.20 (typ.)   |       | 0.244 (typ.)   |       |
| C                 | 2.20 (typ.)   |       | 0.087 (typ.)   |       |
| D                 | ϕ 1.40 (typ.) |       | ϕ 0.055 (typ.) |       |
| E                 | 15.0          | 15.20 | 0.591          | 0.598 |
| F                 | 0.52          | 0.54  | 0.020          | 0.021 |
| G                 | 2.35          | 2.73  | 0.093          | 0.107 |
| H                 | 13.50         | 13.55 | 0.531          | 0.533 |
| I                 | 1.11          | 1.49  | 0.044          | 0.058 |
| J                 | 2.60          | 2.80  | 0.102          | 0.110 |
| K                 | 4.49          | 4.50  | 0.176          | 0.177 |
| L                 | 1.15 (typ.)   |       | 0.045 (typ.)   |       |
| M                 | 3.03          | 3.05  | 0.119          | 0.120 |
| N                 | 2.60          | 2.80  | 0.102          | 0.110 |
| O                 | 6.55          | 6.65  | 0.258          | 0.262 |