TOSHIBA Transistor  Silicon NPN Epitaxial Type

2SC3225

Switching Applications
Solenoid Drive Applications

- High DC current gain: $h_{FE} = 500$ (min) ($I_C = 400$ mA)
- Low collector-emitter saturation voltage: $V_{CE\ (sat)} = 0.5$ V (max) ($I_C = 300$ mA)

Absolute Maximum Ratings ($Ta = 25^\circ$C)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Symbol</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-base voltage</td>
<td>$V_{CBO}$</td>
<td>40</td>
<td>V</td>
</tr>
<tr>
<td>Collector-emitter voltage</td>
<td>$V_{CEO}$</td>
<td>40</td>
<td>V</td>
</tr>
<tr>
<td>Emitter-base voltage</td>
<td>$V_{EBO}$</td>
<td>7</td>
<td>V</td>
</tr>
<tr>
<td>Collector current</td>
<td>$I_C$</td>
<td>2</td>
<td>A</td>
</tr>
<tr>
<td>Base current</td>
<td>$I_B$</td>
<td>0.5</td>
<td>A</td>
</tr>
<tr>
<td>Collector power dissipation</td>
<td>$P_C$</td>
<td>900</td>
<td>mW</td>
</tr>
<tr>
<td>Junction temperature</td>
<td>$T_J$</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>$T_{stg}$</td>
<td>-55 to 150</td>
<td>°C</td>
</tr>
</tbody>
</table>

Note 1: Using continuously under heavy loads (e.g., the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e., operating temperature/current/voltage, etc.) are within the absolute maximum ratings. Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e., reliability test report and estimated failure rate, etc.).

Industrial Applications

<table>
<thead>
<tr>
<th>JEDEC TO-92MOD</th>
<th>JEITA</th>
<th>TOSHIBA 2-SJ1A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight: 0.36 g (typ.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Electrical Characteristics (Ta = 25°C)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Symbol</th>
<th>Test Condition</th>
<th>Min</th>
<th>Typ.</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector cut-off current</td>
<td>ICBO</td>
<td>V CB = 40 V, IE = 0</td>
<td></td>
<td>—</td>
<td>—</td>
<td>10 μA</td>
</tr>
<tr>
<td>Emitter cut-off current</td>
<td>IEBO</td>
<td>V EB = 7 V, IC = 0</td>
<td></td>
<td>—</td>
<td>—</td>
<td>1 μA</td>
</tr>
<tr>
<td>Collector-emitter breakdown voltage</td>
<td>V (BR) CEO</td>
<td>IC = 10 mA, IB = 0</td>
<td>40</td>
<td>—</td>
<td>—</td>
<td>V</td>
</tr>
<tr>
<td>DC current gain</td>
<td>hFE</td>
<td>V CE = 1 V, IC = 400 mA</td>
<td></td>
<td>—</td>
<td>—</td>
<td>500</td>
</tr>
<tr>
<td>Collector-emitter saturation voltage</td>
<td>V CE (sat)</td>
<td>IC = 300 mA, IB = 1 mA</td>
<td></td>
<td>0.3</td>
<td>0.5</td>
<td>V</td>
</tr>
<tr>
<td>Base-emitter saturation voltage</td>
<td>V BE (sat)</td>
<td>IC = 300 mA, IB = 1 mA</td>
<td></td>
<td>—</td>
<td>—</td>
<td>1.1 V</td>
</tr>
<tr>
<td>Transition frequency</td>
<td>ft</td>
<td>V CB = 2 V, IC = 100 mA</td>
<td></td>
<td>220</td>
<td>—</td>
<td>MHz</td>
</tr>
<tr>
<td>Collector output capacitance</td>
<td>C OB</td>
<td>V CB = 10 V, IB = 0, f = 1 MHz</td>
<td></td>
<td>20</td>
<td>—</td>
<td>pF</td>
</tr>
</tbody>
</table>

#### Switching time

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Symbol</th>
<th>Test Condition</th>
<th>Min</th>
<th>Typ.</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn-on time</td>
<td>t on</td>
<td></td>
<td>20 μs</td>
<td>1.0</td>
<td>—</td>
<td>μs</td>
</tr>
<tr>
<td>Storage time</td>
<td>t slg</td>
<td></td>
<td>100 μs</td>
<td>3.0</td>
<td>—</td>
<td>μs</td>
</tr>
<tr>
<td>Fall time</td>
<td>t f</td>
<td>IB1 = 1 mA, IB2 = 1 mA, duty cycle ≤ 1%</td>
<td></td>
<td>1.2</td>
<td>—</td>
<td>μs</td>
</tr>
</tbody>
</table>

#### Marking

- **C3225** Part No. (or abbreviation code)
- **Lot No.**
- **Note2**

**Note2:** A line under a Lot No. identifies the indication of product Labels.

Not underlined: [Pb]/INCLUDES > MCV
Underlined: [G]/RoHS COMPATIBLE or [G]/RoHS [Pb]

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is the Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.
Ambient temperature $T_a$ (°C)

Collector power dissipation $P_C$ (mW)

Collector current $I_C$ (A)

Collector-emitter voltage $V_{CE}$ (V)

Safe Operating Area

Collector current $I_C$ (mA)

Base-emitter saturation voltage $V_{BE}(\text{sat})$

Common emitter $I_C/I_B = 300$

Common emitter

$V_{BE}(\text{sat})$ (V)

$V_{CE} = 1$ V

Curves must be derated linearly with increase in temperature.

*: Single nonrepetitive pulse

$Ta = 25$°C

$Ta = 100$°C

*: Common emitter

$IC_{\text{max}}$ (continuous)

$IC_{\text{max}}$ (pulsed)*

$V_{CEO\text{max}}$

DC operation

$Ta = 25$°C

1 ms*

10 ms*

0.1

0.3

0.5

1

0.01

0.03

0.1

0.3

1

0.01

0.03

1

10

0

0.1

0.3

1

10

0

0.1

0.3

1

10

IC – $V_{BE}$

Base-emitter voltage $V_{BE}$ (V)

Collector-emitter voltage $V_{CE}$ (V)

$IC_{\text{max}}$ (pulsed)*

$IC_{\text{max}}$ (continuous)

$V_{CEO\text{max}}$

IC – $V_{BE}$

Collector current $I_C$ (A)

Base-emitter voltage $V_{BE}$ (V)

Collector current $I_C$ (mA)

Collector power dissipation $P_C$ (mW)

Ambient temperature $T_a$ (°C)

$V_{BE}(\text{sat}) - I_C$

Common emitter $I_C/I_B = 300$

$Ta = -50$°C

$Ta = 25$°C

$Ta = 100$°C

$Ta = -55$°C
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