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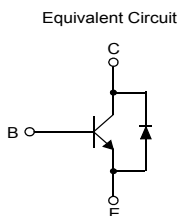
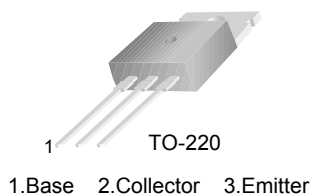
May 2010



# KSC5305D NPN Silicon Transistor

## Features

- High Voltage High Speed Power Switch Application
- Built-in Free-wheeling Diode makes efficient anti saturation operation
- Suitable for half bridge light ballast Applications
- No need to interest an  $h_{FE}$  value because of low variable storage-time spread even though corner spirit product
- Low base drive requirement



## Absolute Maximum Ratings $T_a = 25^\circ\text{C}$ unless otherwise noted

| Symbol    | Parameter                                    | Value       | Units            |
|-----------|--|-------------|------------------|
| $V_{CBO}$ | Collector Base Voltage                       | 800         | V                |
| $V_{CEO}$ | Collector Emitter Voltage                    | 400         | V                |
| $V_{EBO}$ | Emitter Base Voltage                         | 12          | V                |
| $I_C$     | Collector Current (DC)                       | 5           | A                |
| $I_{CP}$  | *Collector Current (Pulse)                   | 10          | A                |
| $I_B$     | Base Current (DC)                            | 2           | A                |
| $I_{BP}$  | *Base Current (Pulse)                        | 4           | A                |
| $P_C$     | Power Dissipation ( $T_C=25^\circ\text{C}$ ) | 75          | W                |
| $T_J$     | Junction Temperature                         | 150         | $^\circ\text{C}$ |
| $T_{STG}$ | Storage Temperature                          | - 65 to 150 | $^\circ\text{C}$ |

\* Pulse Test : Pulse Width = 5mS, Duty cycles  $\leq 10\%$

## Thermal Characteristics

| Symbol          | Parameter          |                     | Rating | Units                     |
|-----------------|--------------------|---------------------|--------|---------------------------|
| $R_{\theta jC}$ | Thermal Resistance | Junction to Case    | 1.65   | $^\circ\text{C}/\text{W}$ |
| $R_{\theta ja}$ |                    | Junction to Ambient | 62.5   | $^\circ\text{C}/\text{W}$ |

**Electrical Characteristics**  $T_a=25^\circ\text{C}$  unless otherwise noted

| Symbol                 | Parameter   | Test Condition   | Min.        | Typ.              | Max.        | Units                                |
|------------------------|---|--|-------------|-------------------|-------------|--------------------------------------|
| $BV_{CBO}$             | Collector-Base Breakdown Voltage                                | $I_C=1\text{mA}, I_E=0$  | 800         | -                 | -           | V                                    |
| $BV_{CEO}$             | Collector-Emitter Breakdown Voltage                             | $I_C=5\text{mA}, I_B=0$  | 400         | -                 | -           | V                                    |
| $BV_{EBO}$             | Emitter-Base Breakdown Voltage                                  | $I_E=1\text{mA}, I_C=0$  | 12          | -                 | -           | V                                    |
| $I_{CBO}$              | Collector Cut-off Current                                       | $V_{CB}=500\text{V}, I_E=0$  | -           | -                 | 10          | $\mu\text{A}$                        |
| $I_{EBO}$              | Emitter Cut-off Current   | $V_{EB}=9\text{V}, I_C=0$  | -           | -                 | 10          | $\mu\text{A}$                        |
| $h_{FE1}$<br>$h_{FE2}$ | DC Current Gain   | $V_{CE}=1\text{V}, I_C=0.8\text{A}$<br>$V_{CE}=1\text{V}, I_C=2\text{A}$   | 22<br>8     | -<br>-            | -<br>-      |                                      |
| $V_{CE}(\text{sat})$   | Collector-Emitter Saturation Voltage                            | $I_C=0.8\text{A}, I_B=0.08\text{A}$<br>$I_C=2\text{A}, I_B=0.4\text{A}$  | -<br>-      | -<br>-            | 0.4<br>0.5  | V<br>V                               |
| $V_{BE}(\text{sat})$   | Base-Emitter Saturation Voltage                                 | $I_C=0.8\text{A}, I_B=0.08\text{A}$<br>$I_C=2\text{A}, I_B=0.4\text{A}$  | -<br>-      | -<br>-            | 1.0<br>1.0  | V<br>V                               |
| $C_{ob}$               | Output Capacitance  | $V_{CB}=10\text{V}, f=1\text{MHz}$   | -           | -                 | 75          | pF                                   |
| $t_{ON}$               | Turn On Time  | $V_{CC}=300\text{V}, I_C=2\text{A},$<br>$I_{B1}=0.4\text{A}, I_{B2}=-1\text{A},$<br>$R_L=150\Omega$                        | -           | -                 | 150         | ns                                   |
| $t_{STG}$              | Storage Time  |  | -           | -                 | 2           | $\mu\text{s}$                        |
| $t_F$                  | Fall Time   |  | -           | -                 | 0.2         | $\mu\text{s}$                        |
| $t_{STG}$              | Storage Time  | $V_{CC}=15\text{V}, V_Z=300\text{V},$<br>$I_C=2\text{A}, I_{B1}=0.4\text{A},$<br>$I_{B2}=-0.4\text{A}, L_C=200\mu\text{H}$ | -           | -                 | 2.25        | $\mu\text{s}$                        |
| $t_F$                  | Fall Time   |  | -           | -                 | 150         | ns                                   |
| $V_F$                  | Diode Forward Voltage   | $I_F=1\text{A}$<br>$I_F=2\text{A}$   | -<br>-      | -<br>-            | 1.5<br>1.6  | V<br>V                               |
| $t_{rr}$               | * Reverse recovery time<br>( $di/dt = 10\text{A}/\mu\text{s}$ ) | $I_F=0.4\text{A}$<br>$I_F=1\text{A}$<br>$I_F=2\text{A}$  | -<br>-<br>- | 800<br>1.4<br>1.9 | -<br>-<br>- | ns<br>$\mu\text{s}$<br>$\mu\text{s}$ |

\* Pulse Test : Pulse Width = 5mS, Duty cycles  $\leq 10\%$

### Typical Characteristics

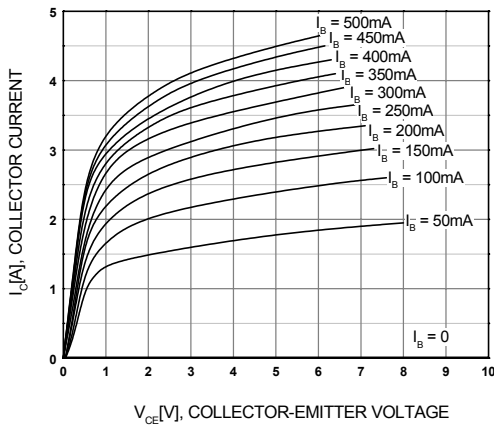


Figure 1. Static Characteristic

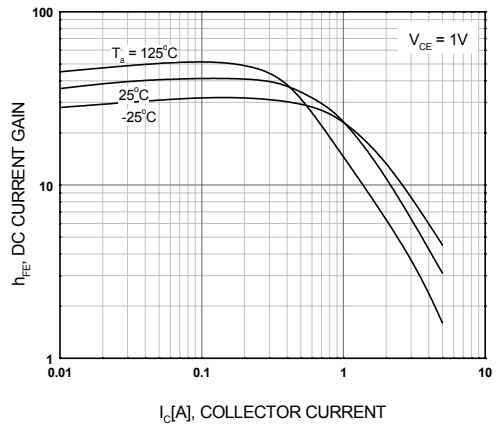


Figure 2. DC current Gain

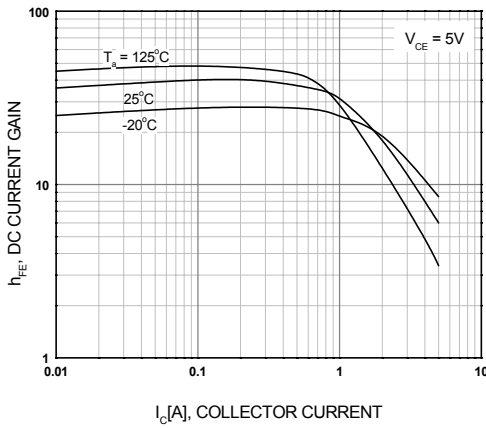


Figure 3. DC current Gain

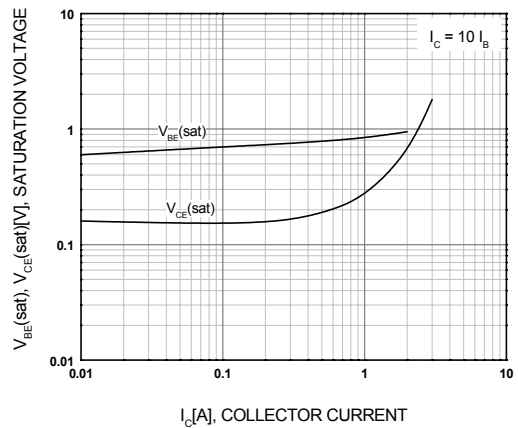


Figure 4. Collector-Emitter Saturation Voltage  
Base-Emitter Saturation Voltage

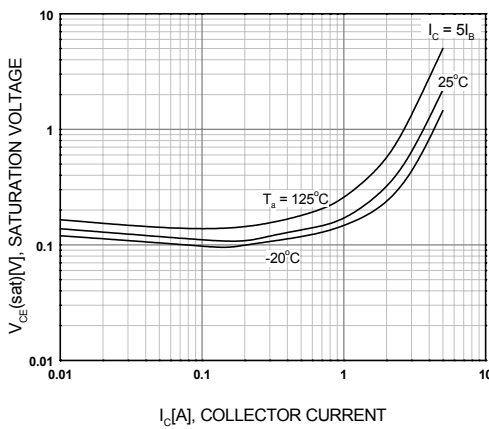


Figure 5. Collector-Emitter Saturation Voltage

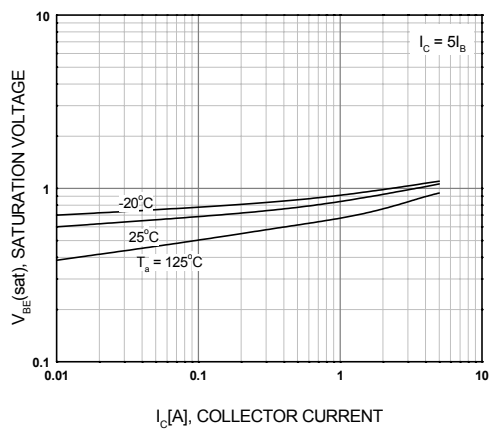
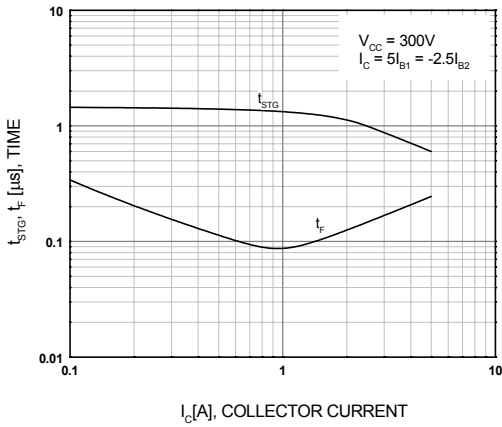
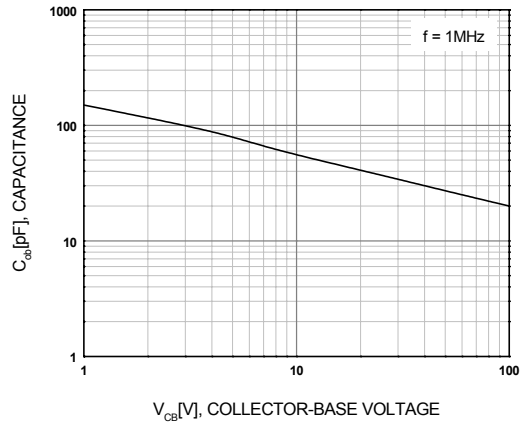


Figure 6. Base-Emitter Saturation Voltage

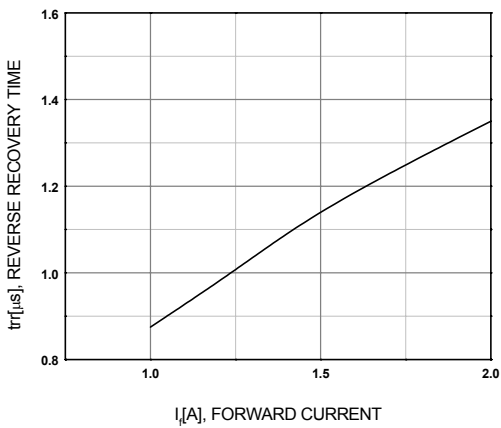
**Typical Characteristics** (Continued)



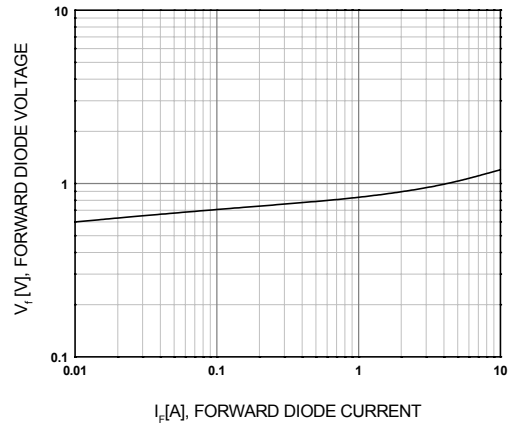
**Figure 7. Switching Time**



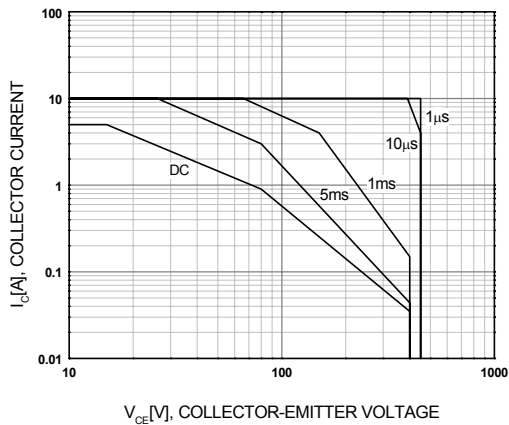
**Figure 8. Collector Output Capacitance**



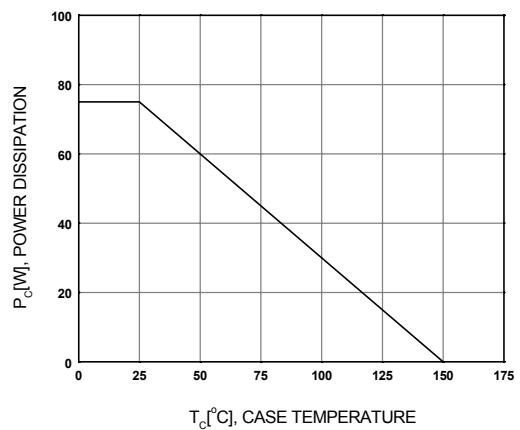
**Figure 9. Reverse Recovery Time**



**Figure 10. Forward Diode Voltage**



**Figure 11. Safe Operating Area**



**Figure 12. Power Derating**

Typical Characteristics (Continued)

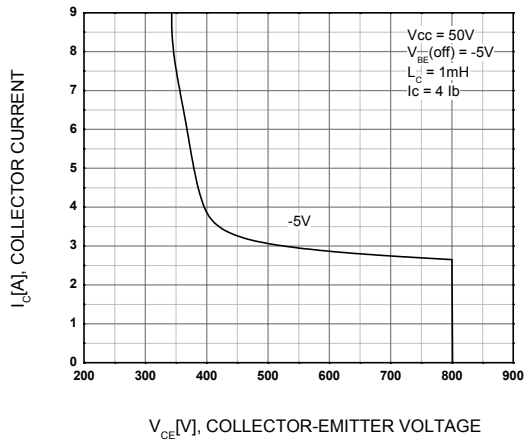


Figure 13. Reverse Bias Safe Operating

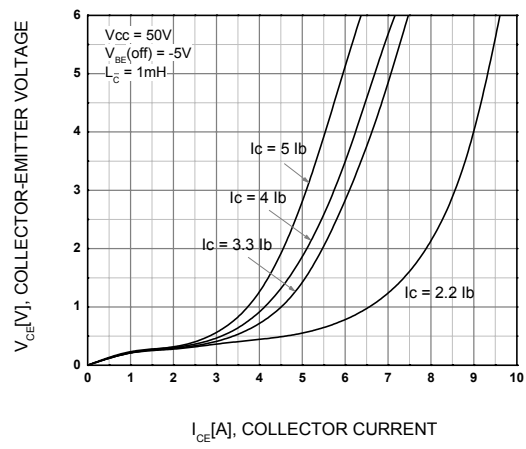
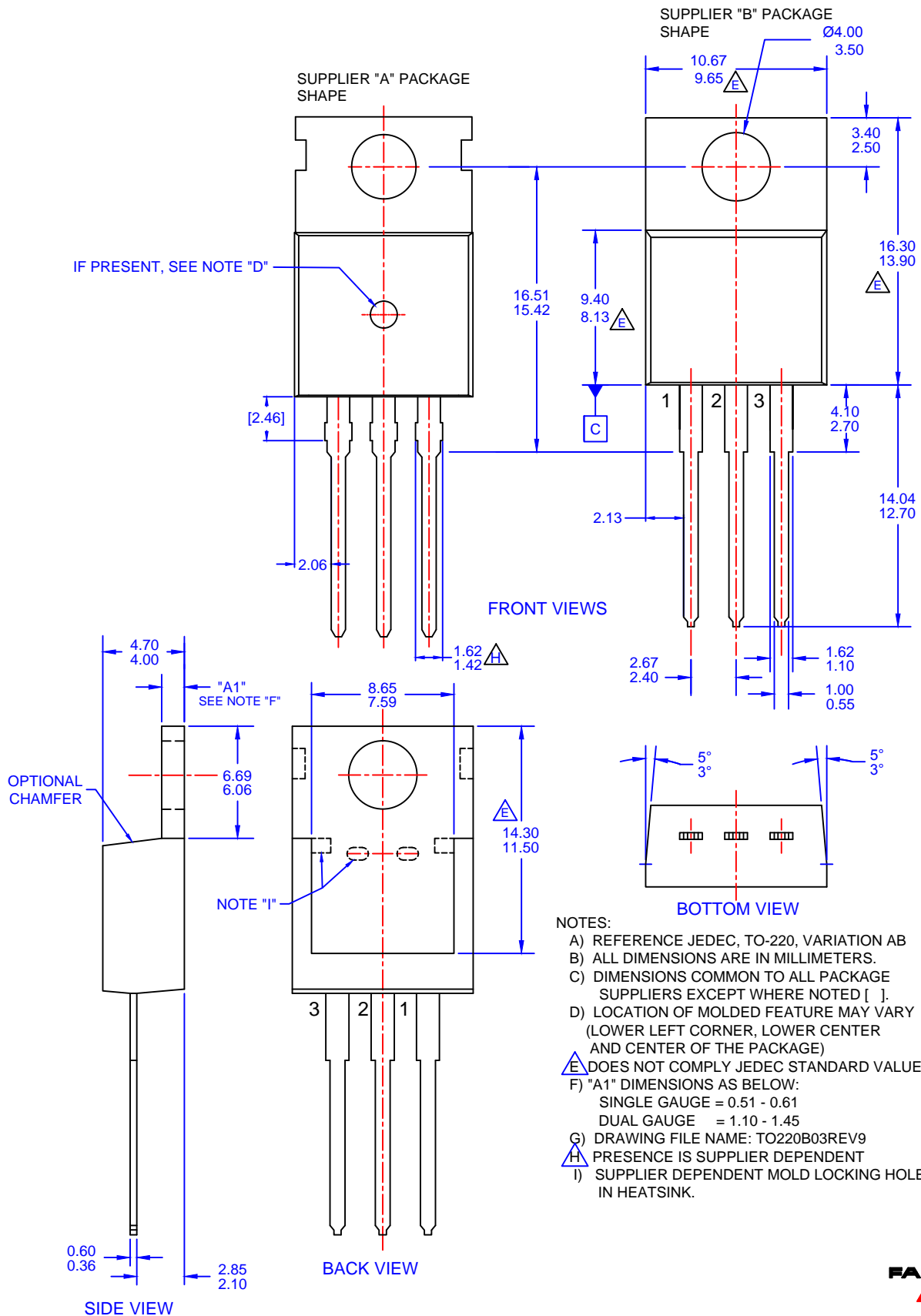


Figure 14. RBSOA Saturation



- NOTES:**
- A) REFERENCE JEDEC, TO-220, VARIATION AB
  - B) ALL DIMENSIONS ARE IN MILLIMETERS.
  - C) DIMENSIONS COMMON TO ALL PACKAGE SUPPLIERS EXCEPT WHERE NOTED [ ].
  - D) LOCATION OF MOLDED FEATURE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE)
  - E) DOES NOT COMPLY JEDEC STANDARD VALUE.
  - F) "A1" DIMENSIONS AS BELOW:  
 SINGLE GAUGE = 0.51 - 0.61  
 DUAL GAUGE = 1.10 - 1.45
  - G) DRAWING FILE NAME: TO220B03REV9
  - H) PRESENCE IS SUPPLIER DEPENDENT
  - I) SUPPLIER DEPENDENT MOLD LOCKING HOLES IN HEATSINK.



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