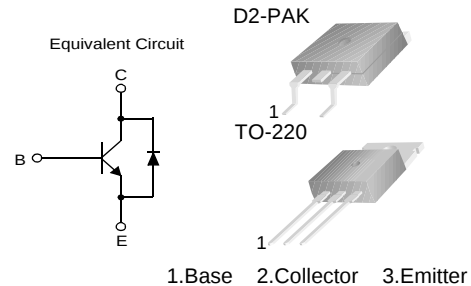


## KSC5338D/KSC5338DW

### High Voltage Power Switch Switching Application

- Wide Safe Operating Area
- Built-in Free-Wheeling Diode
- Suitable for Electronic Ballast Application
- Small Variance in Storage Time
- Two Package Choices : TO-220 or D2-PAK



### NPN Triple Diffused Planar Silicon Transistor

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

| Symbol    | Parameter                                   | Value      | Units            |
|-----------|---------------------------------------------|------------|------------------|
| $V_{CBO}$ | Collector-Base Voltage                      | 1000       | V                |
| $V_{CEO}$ | Collector-Emitter Voltage                   | 450        | 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                         | - 55 ~ 150 | $^\circ\text{C}$ |

\* Pulse Test : Pulse Width = 5ms, Duty Cycle  $\leq 10\%$

#### Thermal Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

| Symbol          | Characteristics                        |                     | Rating | Unit               |
|-----------------|----------------------------------------|---------------------|--------|--------------------|
| $R_{\theta jc}$ | Thermal Resistance                     | Junction to Case    | 1.65   | $^\circ\text{C/W}$ |
| $R_{\theta ja}$ |                                        | Junction to Ambient | 62.5   |                    |
| $T_L$           | Maximum Lead Temperature for Soldering |                     | 270    | $^\circ\text{C}$   |

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

| Symbol         | Parameter                                                         | Test Condition                                                                 | Min.                    | Typ. | Max. | Units         |
|----------------|-------------------------------------------------------------------|--------------------------------------------------------------------------------|-------------------------|------|------|---------------|
| $BV_{CBO}$     | Collector-Base Breakdown Voltage                                  | $I_C=1\text{mA}, I_E=0$                                                        | 1000                    |      |      | V             |
| $BV_{CEO}$     | Collector-Emitter Breakdown Voltage                               | $I_C=5\text{mA}, I_B=0$                                                        | 450                     |      |      | V             |
| $BV_{EBO}$     | Emitter-Base Breakdown Voltage                                    | $I_E=1\text{mA}, I_C=0$                                                        | 12                      |      |      | V             |
| $I_{CBO}$      | Collector Cut-off Current                                         | $V_{CB}=800\text{V}, I_E=0$                                                    |                         |      | 10   | $\mu\text{A}$ |
| $I_{CES}$      | Collector Cut-off Current                                         | $V_{CES}=1000\text{V}, I_{EB}=0$                                               | $T_C=25^\circ\text{C}$  |      | 100  | $\mu\text{A}$ |
|                |                                                                   |                                                                                | $T_C=125^\circ\text{C}$ |      | 500  | $\mu\text{A}$ |
| $I_{CEO}$      | Collector Cut-off Current                                         | $V_{CE}=450\text{V}, I_B=0$                                                    | $T_C=25^\circ\text{C}$  |      | 100  | $\mu\text{A}$ |
|                |                                                                   |                                                                                | $T_C=125^\circ\text{C}$ |      | 500  | $\mu\text{A}$ |
| $I_{EBO}$      | Emitter Cut-off Current                                           | $V_{EB}=10\text{V}, I_C=0$                                                     |                         |      | 10   | $\mu\text{A}$ |
| $h_{FE}$       | DC Current Gain                                                   | $V_{CE}=1\text{V}, I_C=0.8\text{A}$                                            | $T_C=25^\circ\text{C}$  | 15   | 25   |               |
|                |                                                                   |                                                                                | $T_C=125^\circ\text{C}$ | 10   | 14   |               |
|                |                                                                   | $V_{CE}=1\text{V}, I_C=2\text{A}$                                              | $T_C=25^\circ\text{C}$  | 6    | 9    |               |
|                |                                                                   |                                                                                | $T_C=125^\circ\text{C}$ | 4    | 6    |               |
|                |                                                                   | $V_{CE}=2.5\text{V}, I_C=1\text{A}$                                            | $T_C=25^\circ\text{C}$  | 18   | 25   |               |
|                |                                                                   |                                                                                | $T_C=125^\circ\text{C}$ | 14   | 18   |               |
| $V_{CE(sat)}$  | Collector-Emitter Saturation Voltage                              | $I_C=0.8\text{A}, I_B=0.08\text{A}$                                            | $T_C=25^\circ\text{C}$  | 0.35 | 0.5  | V             |
|                |                                                                   |                                                                                | $T_C=125^\circ\text{C}$ | 0.55 | 0.75 | V             |
|                |                                                                   | $I_C=2\text{A}, I_B=0.4\text{A}$                                               | $T_C=25^\circ\text{C}$  | 0.47 | 0.75 | V             |
|                |                                                                   |                                                                                | $T_C=125^\circ\text{C}$ | 0.9  | 1.1  | V             |
|                |                                                                   | $I_C=0.8\text{A}, I_B=0.04\text{A}$                                            | $T_C=25^\circ\text{C}$  | 0.9  | 1.5  | V             |
|                |                                                                   |                                                                                | $T_C=125^\circ\text{C}$ | 1.8  | 2.5  | V             |
|                |                                                                   | $I_C=1\text{A}, I_B=0.2\text{A}$                                               | $T_C=25^\circ\text{C}$  | 0.22 | 0.5  | V             |
|                |                                                                   |                                                                                | $T_C=125^\circ\text{C}$ | 0.3  | 0.6  | V             |
| $V_{BE(sat)}$  | Base-Emitter Saturation Voltage                                   | $I_{CS}=0.8\text{A}, I_B=0.08\text{A}$                                         | $T_C=25^\circ\text{C}$  | 0.8  | 1.0  | V             |
|                |                                                                   |                                                                                | $T_C=125^\circ\text{C}$ | 0.65 | 0.9  | V             |
|                |                                                                   | $I_C=2\text{A}, I_B=0.4\text{A}$                                               | $T_C=25^\circ\text{C}$  | 0.9  | 1.0  | V             |
|                |                                                                   |                                                                                | $T_C=125^\circ\text{C}$ | 0.8  | 0.9  | V             |
| $C_{ib}$       | Input Capacitance                                                 | $V_{EB}=10\text{V}, I_C=0.5\text{A}, f=1\text{MHz}$                            |                         | 550  | 750  | pF            |
| $C_{ob}$       | Output Capacitance                                                | $V_{CB}=10\text{V}, I_E=0, f=1\text{MHz}$                                      |                         | 60   | 100  | pF            |
| $f_T$          | Current Gain Bandwidth Product                                    | $I_C=0.5\text{A}, V_{CE}=10\text{V}$                                           |                         | 11   |      | MHz           |
| $V_F$          | Diode Forward Voltage                                             | $I_F=1\text{A}, I_C=1\text{mA}, I_E=0$                                         | $T_C=25^\circ\text{C}$  | 0.86 | 1.3  | V             |
|                |                                                                   |                                                                                | $T_C=125^\circ\text{C}$ | 0.79 |      | V             |
|                |                                                                   | $I_F=2\text{A}$                                                                | $T_C=25^\circ\text{C}$  | 0.95 | 1.5  | V             |
|                |                                                                   |                                                                                | $T_C=125^\circ\text{C}$ | 0.88 |      | V             |
| $t_{fr}$       | Diode Forward Recovery Time<br>( $di/dt=10\text{A}/\mu\text{s}$ ) | $I_F=0.4\text{A}$                                                              |                         | 460  |      | ns            |
|                |                                                                   | $I_F=1\text{A}$                                                                |                         | 360  |      | ns            |
|                |                                                                   | $I_F=2\text{A}$                                                                |                         | 325  |      | ns            |
| $V_{CE(DSAT)}$ | Dynamic Saturation Voltage                                        | $I_C=1\text{A}, I_{B1}=100\text{mA}$<br>$V_{CC}=300\text{V}$ at $1\mu\text{s}$ | $T_C=25^\circ\text{C}$  | 8    |      | V             |
|                |                                                                   |                                                                                | $T_C=125^\circ\text{C}$ | 15   |      | V             |
|                |                                                                   | $I_C=1\text{A}, I_{B1}=100\text{mA}$<br>$V_{CC}=300\text{V}$ at $3\mu\text{s}$ | $T_C=25^\circ\text{C}$  | 2.9  |      | V             |
|                |                                                                   |                                                                                | $T_C=125^\circ\text{C}$ | 8    |      | V             |
|                |                                                                   | $I_C=2\text{A}, I_{B1}=400\text{mA}$<br>$V_{CC}=300\text{V}$ at $1\mu\text{s}$ | $T_C=25^\circ\text{C}$  | 9    |      | V             |
|                |                                                                   |                                                                                | $T_C=125^\circ\text{C}$ | 17   |      | V             |
|                |                                                                   | $I_C=2\text{A}, I_{B1}=400\text{mA}$<br>$V_{CC}=300\text{V}$ at $3\mu\text{s}$ | $T_C=25^\circ\text{C}$  | 1.9  |      | V             |
|                |                                                                   |                                                                                | $T_C=125^\circ\text{C}$ | 8.5  |      | V             |

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

| Symbol                                                 | Parameter       | Test Condition                                                                                                             |                       | Min  | Typ. | Max. | Units |
|--------------------------------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------|-----------------------|------|------|------|-------|
| RESISTIVE LOAD SWITCHING (D.C ≤ 10%, Pulse Width=40μs) |                 |                                                                                                                            |                       |      |      |      |       |
| t <sub>ON</sub>                                        | Turn ON Time    | I <sub>C</sub> =2.5A, I <sub>B1</sub> =500mA<br>I <sub>B2</sub> =1A, V <sub>CC</sub> =250V, R <sub>L</sub> = 100Ω          |                       |      | 500  | 750  | ns    |
| t <sub>STG</sub>                                       | Storage Time    |                                                                                                                            |                       | 1.2  |      | 1.5  | μs    |
| t <sub>F</sub>                                         | Fall Time       |                                                                                                                            |                       |      | 100  | 200  | ns    |
| t <sub>ON</sub>                                        | Turn ON Time    | I <sub>C</sub> =2A,<br>I <sub>B1</sub> =400mA<br>I <sub>B2</sub> =1A,<br>V <sub>CC</sub> =300V<br>R <sub>L</sub> = 150Ω    | T <sub>C</sub> =25°C  |      | 100  | 150  | ns    |
| t <sub>STG</sub>                                       | Storage Time    |                                                                                                                            | T <sub>C</sub> =125°C |      | 150  |      | ns    |
|                                                        |                 |                                                                                                                            | T <sub>C</sub> =25°C  | 1.4  | 2.2  | μs   |       |
|                                                        |                 |                                                                                                                            | T <sub>C</sub> =125°C | 1.7  |      | μs   |       |
| t <sub>F</sub>                                         | Fall Time       |                                                                                                                            | T <sub>C</sub> =25°C  |      | 90   | 150  | ns    |
|                                                        |                 |                                                                                                                            | T <sub>C</sub> =125°C |      | 150  |      | ns    |
| t <sub>ON</sub>                                        | Turn ON Time    | I <sub>C</sub> =2.5A,<br>I <sub>B1</sub> =500mA<br>I <sub>B2</sub> =5mA,<br>V <sub>CC</sub> =300V<br>R <sub>L</sub> = 120Ω | T <sub>C</sub> =25°C  |      | 120  | 150  | ns    |
| t <sub>STG</sub>                                       | Storage Time    |                                                                                                                            | T <sub>C</sub> =125°C |      | 150  |      | ns    |
|                                                        |                 |                                                                                                                            | T <sub>C</sub> =25°C  | 1.8  |      | 2.1  | μs    |
|                                                        |                 |                                                                                                                            | T <sub>C</sub> =125°C |      | 2.6  |      | μs    |
| t <sub>F</sub>                                         | Fall Time       |                                                                                                                            | T <sub>C</sub> =25°C  |      | 110  | 150  | ns    |
|                                                        |                 |                                                                                                                            | T <sub>C</sub> =125°C |      | 160  |      | ns    |
| INDUCTIVE LOAD SWITCHING (V <sub>CC</sub> =15V)        |                 |                                                                                                                            |                       |      |      |      |       |
| t <sub>STG</sub>                                       | Storage Time    | I <sub>C</sub> =2.5A,<br>I <sub>B1</sub> =500mA<br>I <sub>B2</sub> =0.5A,<br>V <sub>Z</sub> =350V<br>L <sub>C</sub> =300μH | T <sub>C</sub> =25°C  |      | 1.9  | 2.2  | μs    |
|                                                        |                 |                                                                                                                            | T <sub>C</sub> =125°C |      | 2.4  |      | μs    |
| t <sub>F</sub>                                         | Fall Time       |                                                                                                                            | T <sub>C</sub> =25°C  |      | 160  | 200  | ns    |
|                                                        |                 |                                                                                                                            | T <sub>C</sub> =125°C |      | 330  |      | ns    |
| t <sub>C</sub>                                         | Cross-over Time |                                                                                                                            | T <sub>C</sub> =25°C  |      | 350  | 500  | ns    |
|                                                        |                 |                                                                                                                            | T <sub>C</sub> =125°C |      | 750  |      | ns    |
| t <sub>STG</sub>                                       | Storage Time    | I <sub>C</sub> =2A,<br>I <sub>B1</sub> =400mA<br>I <sub>B2</sub> =0.4A,<br>V <sub>Z</sub> =300V<br>L <sub>C</sub> =200μH   | T <sub>C</sub> =25°C  | 1.95 |      | 2.25 | μs    |
|                                                        |                 |                                                                                                                            | T <sub>C</sub> =125°C |      | 2.9  |      | μs    |
| t <sub>F</sub>                                         | Fall Time       |                                                                                                                            | T <sub>C</sub> =25°C  |      | 120  | 150  | ns    |
|                                                        |                 |                                                                                                                            | T <sub>C</sub> =125°C |      | 270  |      | ns    |
| t <sub>C</sub>                                         | Cross-over Time |                                                                                                                            | T <sub>C</sub> =25°C  |      | 300  | 450  | ns    |
|                                                        |                 |                                                                                                                            | T <sub>C</sub> =125°C |      | 700  |      | ns    |
| t <sub>STG</sub>                                       | Storage Time    | I <sub>C</sub> =1A,<br>I <sub>B1</sub> =100mA<br>I <sub>B2</sub> =0.5A,<br>V <sub>Z</sub> =300V<br>L <sub>C</sub> =200μH   | T <sub>C</sub> =25°C  |      | 0.6  | 0.8  | μs    |
|                                                        |                 |                                                                                                                            | T <sub>C</sub> =125°C |      | 1.0  |      | μs    |
| t <sub>F</sub>                                         | Fall Time       |                                                                                                                            | T <sub>C</sub> =25°C  |      | 70   |      | ns    |
|                                                        |                 |                                                                                                                            | T <sub>C</sub> =125°C |      | 110  |      | ns    |
| t <sub>C</sub>                                         | Cross-over Time |                                                                                                                            | T <sub>C</sub> =25°C  |      | 80   | 130  | ns    |
|                                                        |                 |                                                                                                                            | T <sub>C</sub> =125°C |      | 170  |      | ns    |

## Typical Characteristics

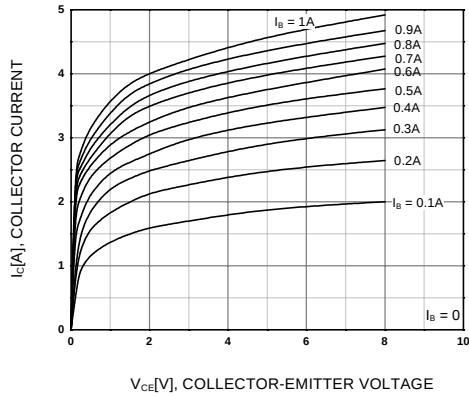


Figure 1. Static Characteristic

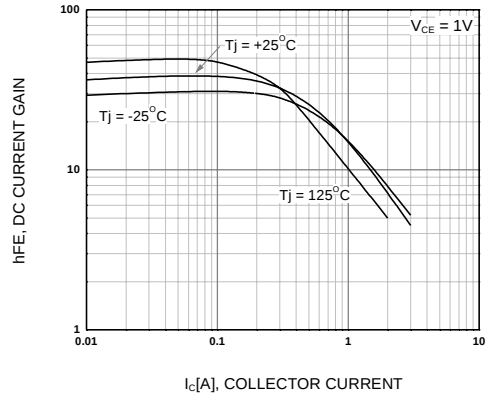


Figure 2. DC current Gain

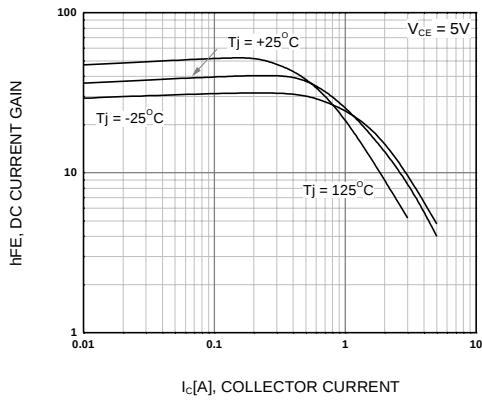


Figure 3. DC current Gain

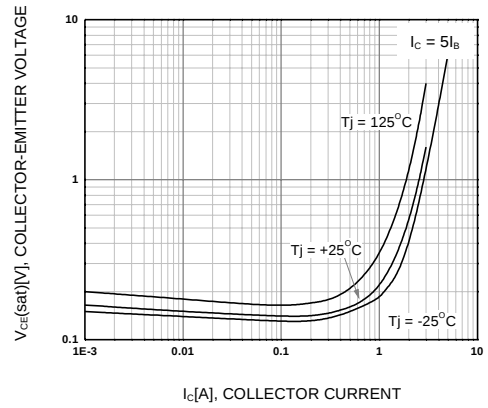


Figure 4. Collector-Emitter Saturation Voltage

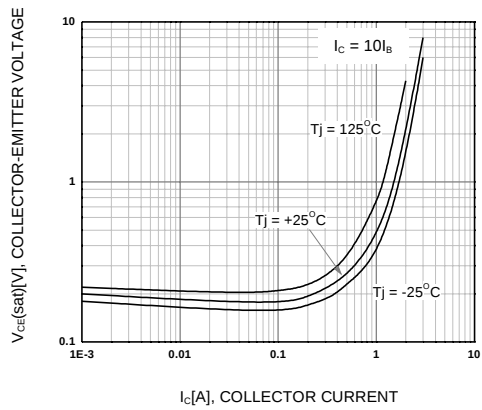


Figure 5. Collector-Emitter Saturation Voltage

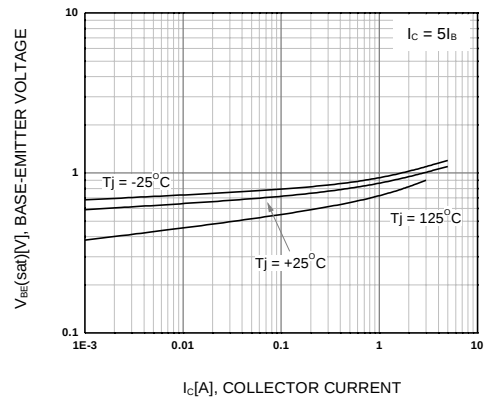


Figure 6. Base-Emitter Saturation Voltage

## Typical Characteristics (Continued)

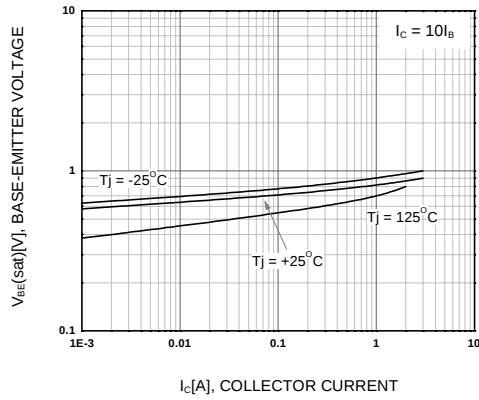


Figure 7. Base-Emitter Saturation Voltage

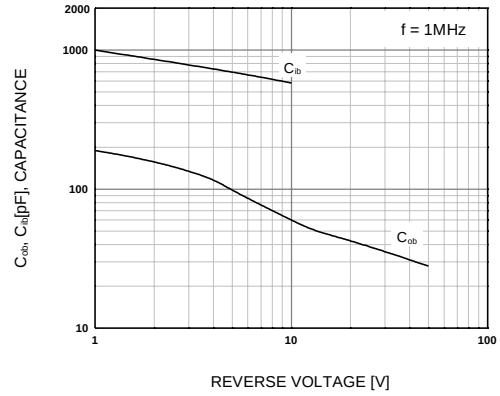


Figure 8. Collector Output Capacitance

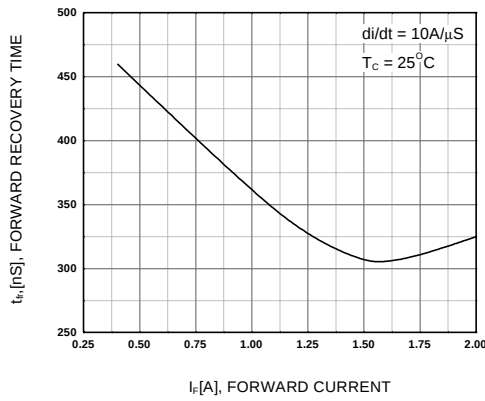


Figure 9. Forward Recovery Time

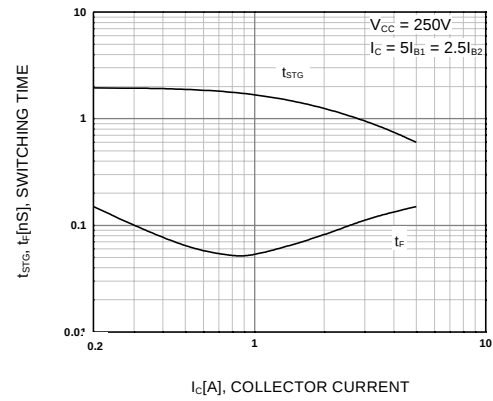


Figure 10. Switching Time

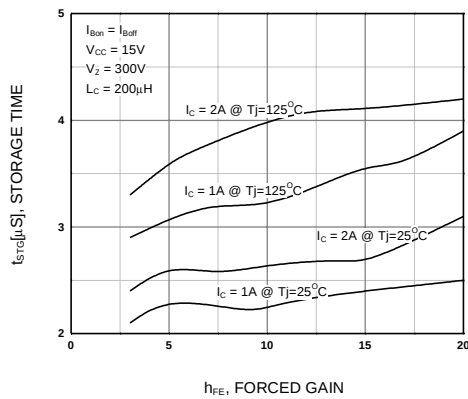


Figure 11. Induction Storage Time

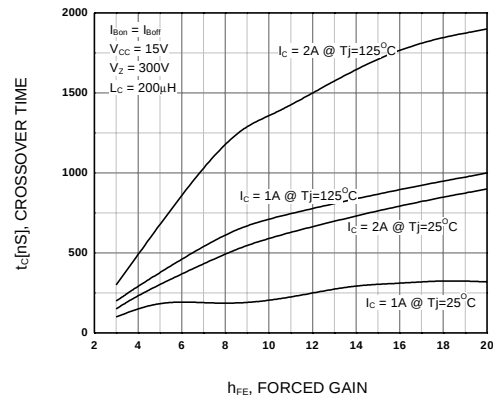


Figure 12. Inductive Crossover Time

# Typical Characteristics (Continued)

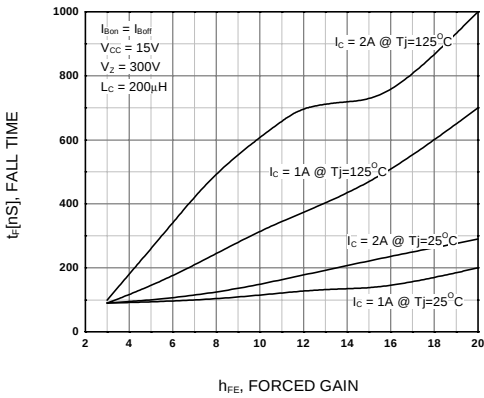


Figure 13. Inductive Fall Time

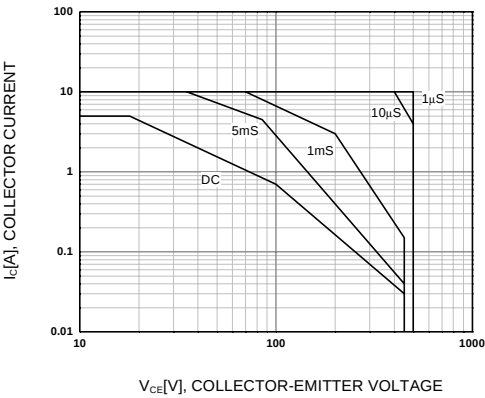


Figure 14. Safe Operating Area

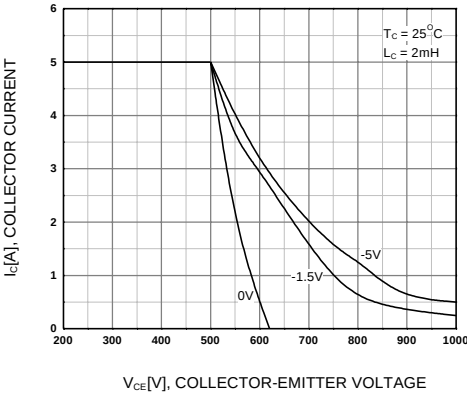


Figure 15. Reverse Bias Safe Operating

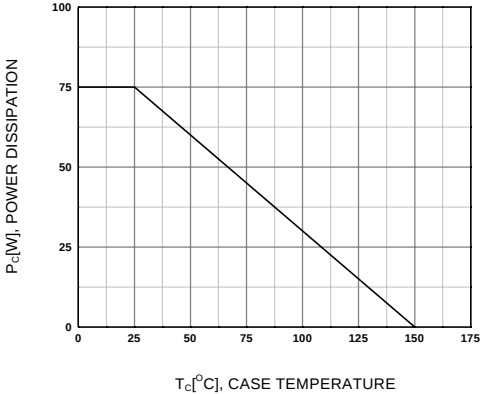
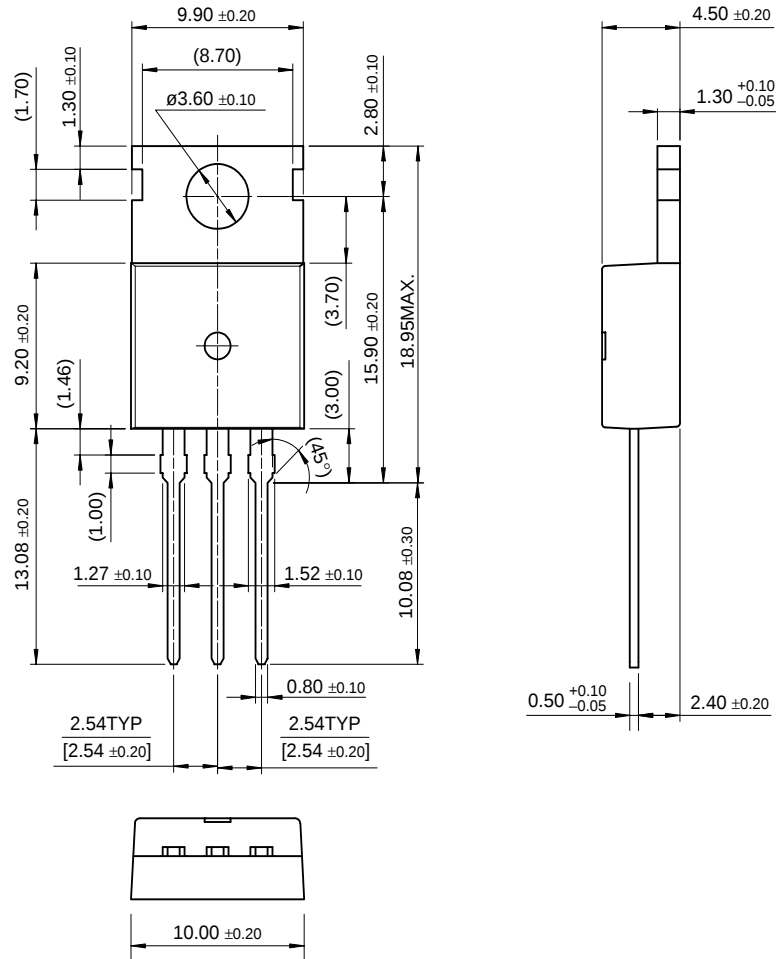


Figure 16. Power Derating

# Package Dimensions

## TO-220



Dimensions in Millimeters

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CoolFET™  
CROSSVOLT™  
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FACT™  
FACT Quiet Series™  
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FASTr™  
GTO™

HiSeC™  
ISOPLANAR™  
MICROWIRE™  
POP™  
PowerTrench®  
QFET™  
QS™  
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SuperSOT™-6

SuperSOT™-8  
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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

## PRODUCT STATUS DEFINITIONS

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| Datasheet Identification | Product Status         | Definition                                                                                                                                                                                                            |
|--------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Advance Information      | Formative or In Design | This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.                                                                                    |
| Preliminary              | First Production       | This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design. |
| No Identification Needed | Full Production        | This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.                                                       |
| Obsolete                 | Not In Production      | This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.                                                   |