



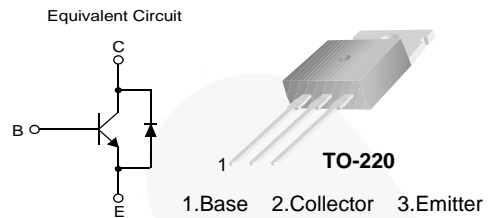
January 2016



# KSC5603D NPN Silicon Transistor, Planar Silicon Transistor

## Features

- High Voltage High Speed Power Switch Application
- Wide Safe Operating Area
- Built-in Free Wheeling Diode
- Suitable for Electronic Ballast Application
- Small Variance in Storage Time



## Ordering Information

Part Number	Marking	Package	Packing Method
KSC5603DTU	C5603D	TO-220 3L	Rail

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter	Value	Unit
$V_{CBO}$	Collector-Base Voltage	1600	V
$V_{CEO}$	Collector-Emitter Voltage	800	V
$V_{EBO}$	Emitter-Base Voltage	12	V
$I_C$	Collector Current (DC)	3	A
$I_{CP}$	Collector Current (Pulse) <sup>(1)</sup>	6	A
$I_B$	Base Current (DC)	2	A
$I_{BP}$	Base Current (Pulse) <sup>(1)</sup>	4	A
$P_C$	Power Dissipation ( $T_C = 25^\circ\text{C}$ )	100	W
$T_J$	Junction Temperature	150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature	-65 to +150	$^\circ\text{C}$

### Notes:

1. Pulse test: pulse width = 5 ms, duty cycle  $\leq 10\%$

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## Thermal Characteristics

Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter	Rating	Unit	
$R_{\theta JC}$	Thermal Resistance	Junction-to-Case	1.25	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$		Junction-to-Ambient	80	$^\circ\text{C}/\text{W}$
$T_L$	Maximum Lead Temperature for Soldering Purpose : 1/8" from Case for 5 seconds		270	$^\circ\text{C}$

## Electrical Characteristics

Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit	
$BV_{CBO}$	Collector-Base Breakdown Voltage	$I_C = 0.5\text{ mA}, I_E = 0$	1600	1689		V	
$BV_{CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 5\text{ mA}, I_B = 0$	800	870		V	
$BV_{EBO}$	Emitter-Base Breakdown Voltage	$I_E = 0.5\text{ mA}, I_C = 0$	12.0	14.8		V	
$I_{CES}$	Collector Cut-Off Current	$V_{CE} = 1600\text{ V}, V_{BE} = 0$	$T_A = 25^\circ\text{C}$	0.01	100	$\mu\text{A}$	
			$T_A = 125^\circ\text{C}$		1000		
$I_{CEO}$	Collector Cut-Off Current	$V_{CE} = 800\text{ V}, I_B = 0$	$T_A = 25^\circ\text{C}$	0.01	100	$\mu\text{A}$	
			$T_A = 125^\circ\text{C}$		1000		
$I_{EBO}$	Emitter Cut-Off Current	$V_{EB} = 12\text{ V}, I_C = 0$		0.05	500	$\mu\text{A}$	
$h_{FE}$	DC Current Gain	$V_{CE} = 3\text{ V}, I_C = 0.4\text{ A}$	$T_A = 25^\circ\text{C}$	20	29	35	
			$T_A = 125^\circ\text{C}$	6	15		
		$V_{CE} = 10\text{ V}, I_C = 5\text{ mA}$	$T_A = 25^\circ\text{C}$	20	43		
			$T_A = 125^\circ\text{C}$	20	46		
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 250\text{ mA}, I_B = 25\text{ mA}$		0.50	1.25	V	
		$I_C = 500\text{ mA}, I_B = 50\text{ mA}$		1.50	2.50		
		$I_C = 1\text{ A}, I_B = 0.2\text{ A}$		1.20	2.50		
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	$I_C = 500\text{ mA}, I_B = 50\text{ mA}$	$T_A = 25^\circ\text{C}$	0.74	1.20	V	
			$T_A = 125^\circ\text{C}$	0.61	1.10		
		$I_C = 2\text{ A}, I_B = 0.4\text{ A}$	$T_A = 25^\circ\text{C}$	0.85	1.20		
			$T_A = 125^\circ\text{C}$	0.74	1.10		
$C_{ib}$	Input Capacitance	$V_{EB} = 10\text{ V}, I_C = 0, f = 1\text{ MHz}$		745	1000	pF	
$C_{ob}$	Output Capacitance	$V_{CB} = 10\text{ V}, I_E = 0, f = 1\text{ MHz}$		56	500	pF	
$f_T$	Current Gain Bandwidth Product	$I_C = 0.1\text{ A}, V_{CE} = 10\text{ V}$		5		MHz	
$V_F$	Diode Forward Voltage	$I_F = 0.4\text{ A}$		0.76	1.20	V	
		$I_F = 1\text{ A}$		0.83	1.50		

**Electrical Characteristics** (Continued)Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
RESISTIVE LOAD SWITCHING (D.C. $\leq$ 10%, Pulse Width = 20 $\mu\text{s}$ )						
$t_{\text{ON}}$	Turn-On Time	$I_C = 0.3\text{ A}$ , $I_{B1} = 50\text{ mA}$ , $I_{B2} = 150\text{ mA}$ , $V_{CC} = 125\text{ V}$ , $R_L = 416\ \Omega$		400	600	ns
$t_{\text{STG}}$	Storage Time		2.0	2.1	2.3	$\mu\text{s}$
$t_F$	Fall Time			310	1000	ns
$t_{\text{ON}}$	Turn-On Time	$I_C = 0.5\text{ A}$ , $I_{B1} = 50\text{ mA}$ , $I_{B2} = 250\text{ mA}$ , $V_{CC} = 125\text{ V}$ , $R_L = 250\ \Omega$		600	1100	ns
$t_{\text{STG}}$	Storage Time			1.3	1.5	$\mu\text{s}$
$t_F$	Fall Time			180	350	ns
INDUCTIVE LOAD SWITCHING ( $V_{CC} = 15\text{ V}$ )						
$t_{\text{STG}}$	Storage Time	$I_C = 0.3\text{ A}$ , $I_{B1} = 50\text{ mA}$ , $I_{B2} = 150\text{ mA}$ , $V_Z = 300\text{ V}$ , $L_C = 200\text{ H}$	0.60	0.73	0.90	$\mu\text{s}$
$t_F$	Fall Time			170	250	ns
$t_C$	Cross-Over Time			180	250	ns
$t_{\text{STG}}$	Storage Time	$I_C = 0.5\text{ A}$ , $I_{B1} = 50\text{ mA}$ , $I_{B2} = 250\text{ mA}$ , $V_Z = 300\text{ V}$ , $L_C = 200\text{ H}$	0.70	0.84	1.00	$\mu\text{s}$
$t_F$	Fall Time			140	175	ns
$t_C$	Cross-Over Time			170	200	ns

## Typical Performance Characteristics

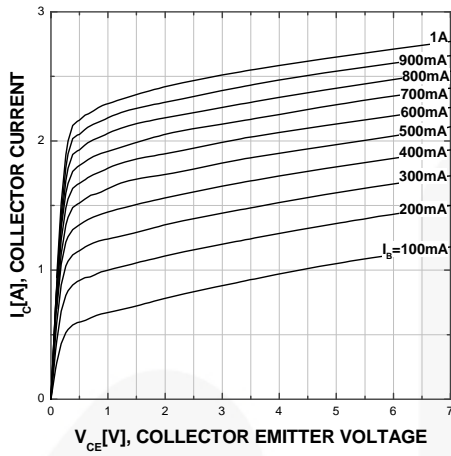


Figure 1. Static Characteristic

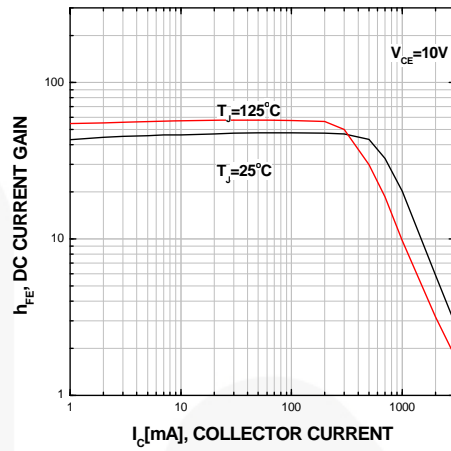


Figure 2. DC Current Gain

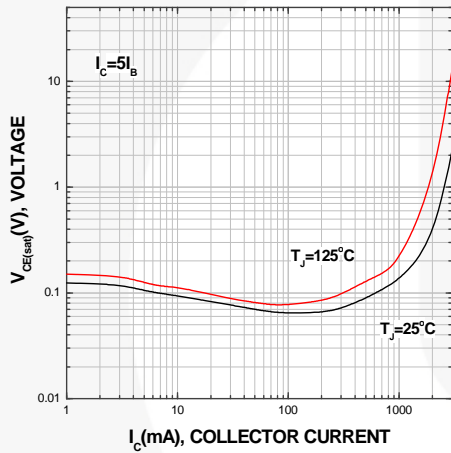


Figure 3. Collector-Emitter Saturation Voltage

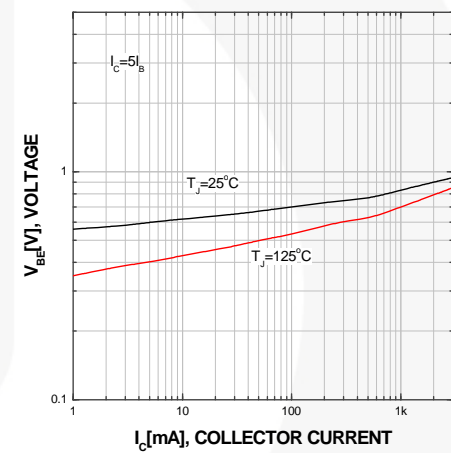


Figure 4. Base-Emitter Saturation Voltage

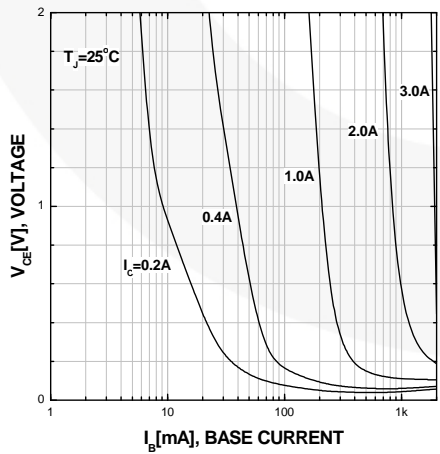


Figure 5. Typical Collector Saturation Voltage

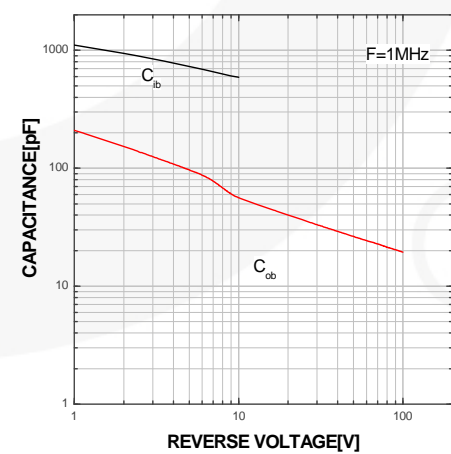


Figure 6. Capacitance

Typical Performance Characteristics (Continued)

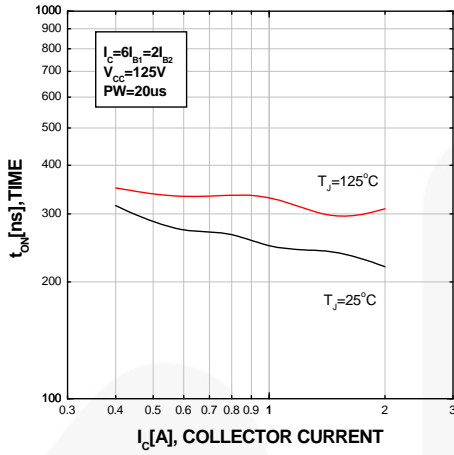


Figure 7. Resistive Switching Time,  $t_{on}$

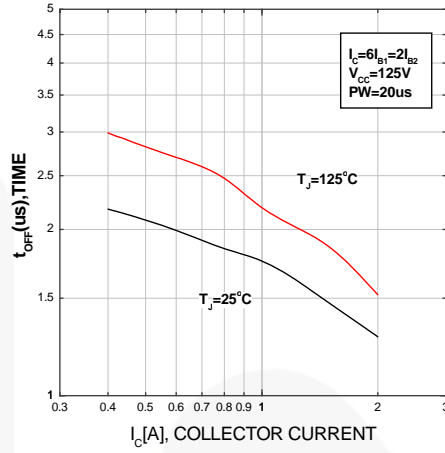


Figure 8. Resistive Switching Time,  $t_{off}$

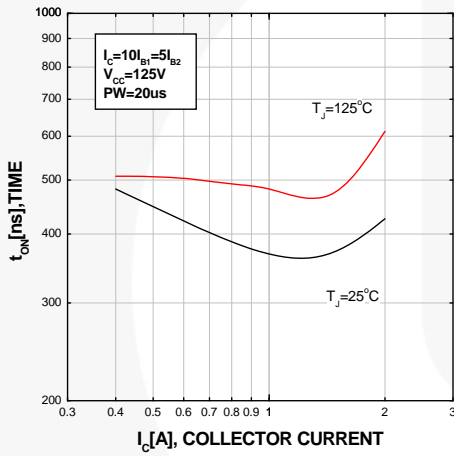


Figure 9. Resistive Switching Time,  $t_{on}$

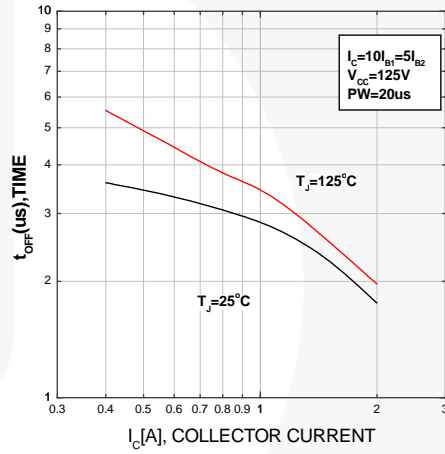


Figure 10. Resistive Switching Time,  $t_{off}$

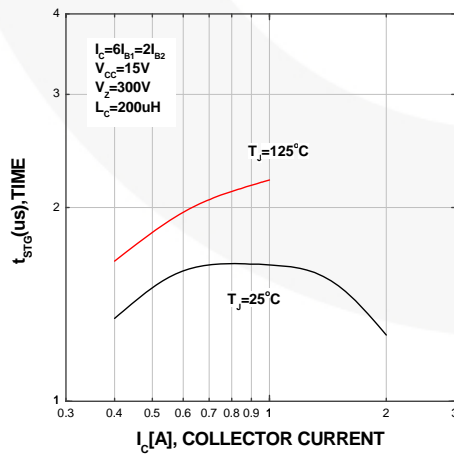


Figure 11. Inductive Switching Time,  $t_{STG}$

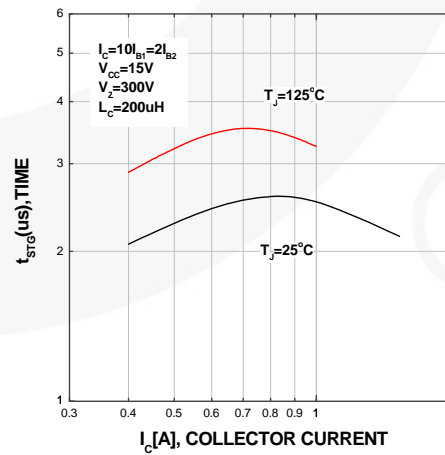


Figure 12. Inductive Switching Time,  $t_{STG}$

Typical Performance Characteristics (Continued)

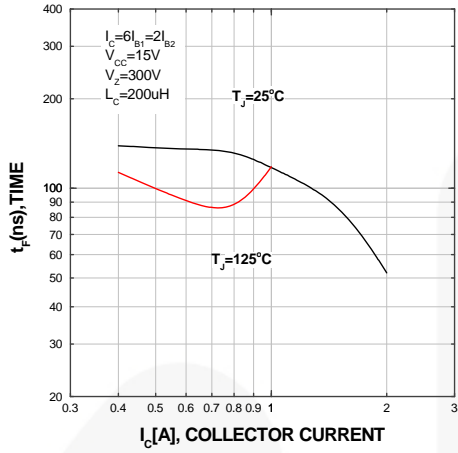


Figure 13. Inductive Switching Time,  $t_f$

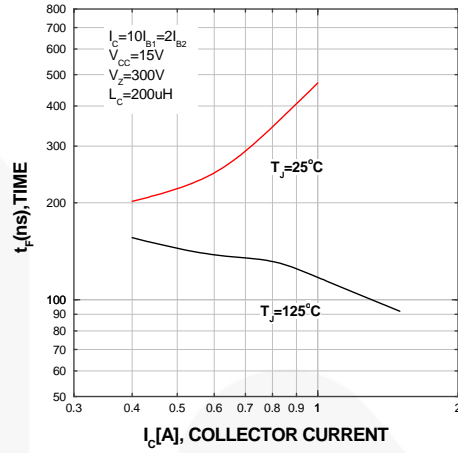


Figure 14. Inductive Switching Time,  $t_f$

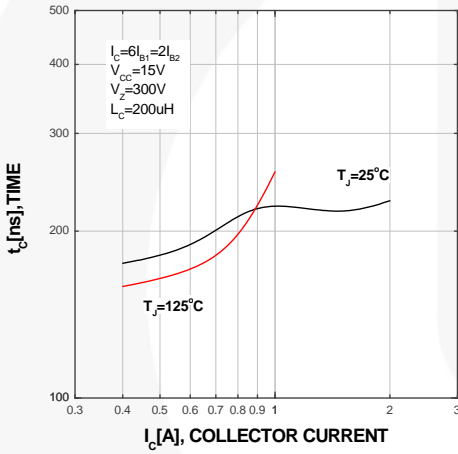


Figure 15. Inductive Switching Time,  $t_c$

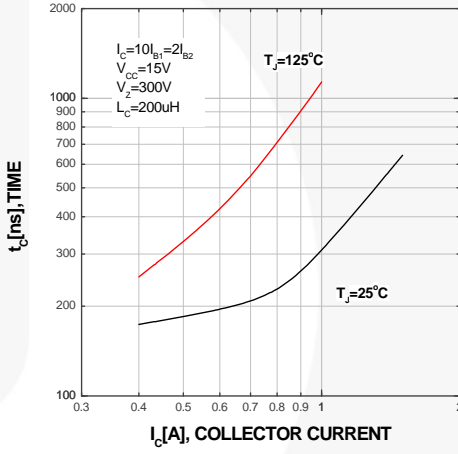


Figure 16. Inductive Switching Time,  $t_c$

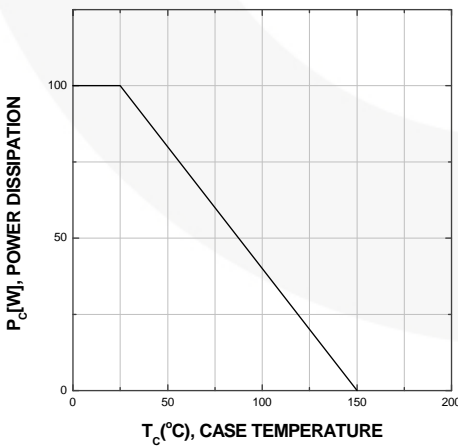
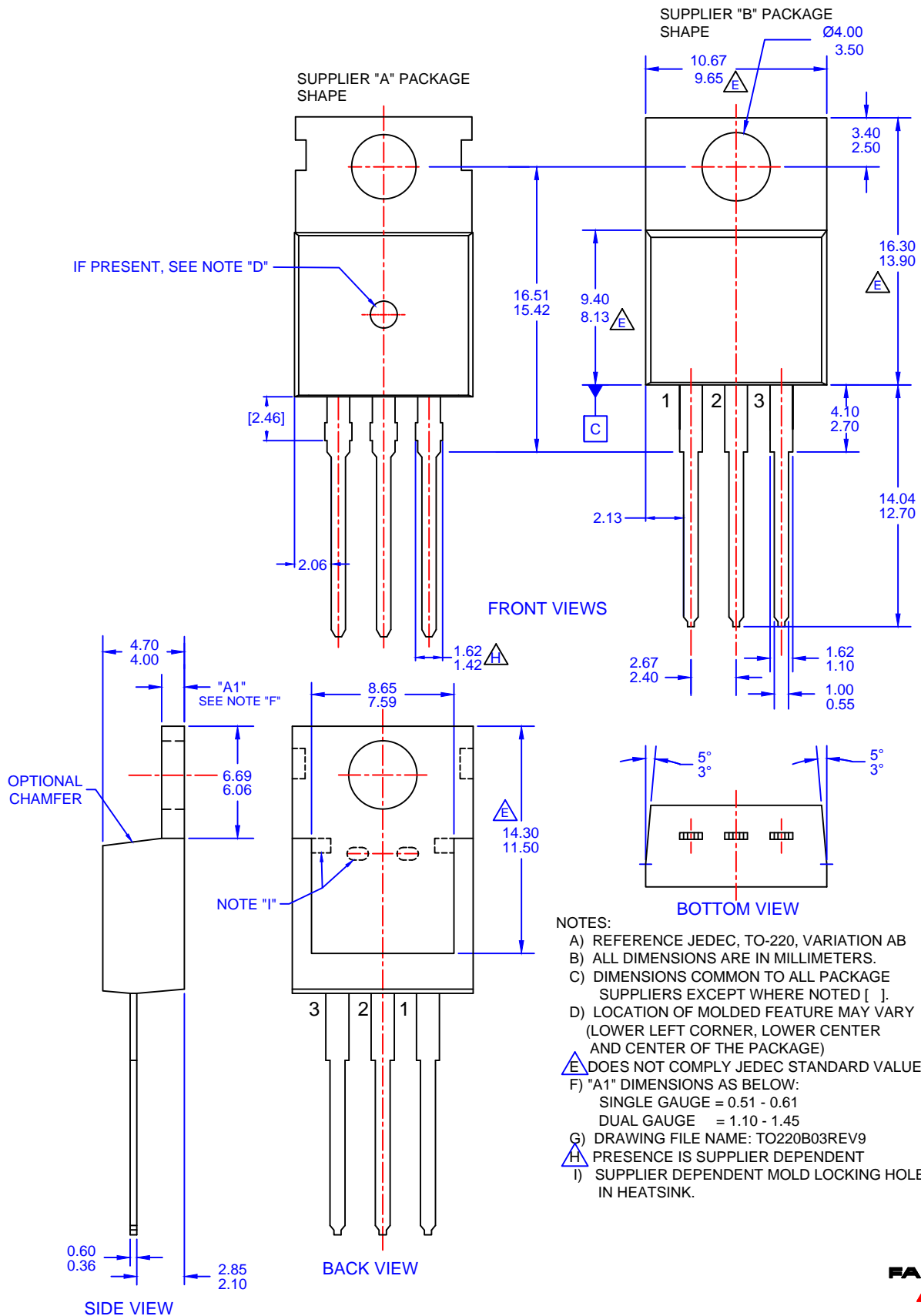


Figure 17. Power Derating



- 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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**Definition of Terms**

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

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