

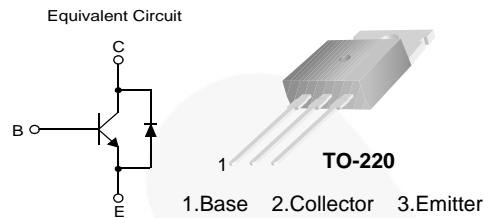


December 2015

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) ⁽¹⁾	6	A
I_B	Base Current (DC)	2	A
I_{BP}	Base Current (Pulse) ⁽¹⁾	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	$V_{CES} = 1600\text{ V}, I_E = 0$	$T_A = 25^\circ\text{C}$	0.01	100	μA	
			$T_A = 125^\circ\text{C}$		1000		
I_{CEO}	Collector Cut-Off Current	$V_{CE} = 800\text{ V}, V_{BE} = 0$	$T_A = 25^\circ\text{C}$	0.01	100	μA	
			$T_A = 125^\circ\text{C}$		1000		
I_{EBO}	Emitter Cut-Off Current	$V_{EB} = 12\text{ V}, I_C = 0$		0.05	500	μA	
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 μs)						
t_{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_{STG}	Storage Time		2.0	2.1	2.3	μs
t_F	Fall Time			310	1000	ns
t_{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_{STG}	Storage Time			1.3	1.5	μs
t_F	Fall Time			180	350	ns
INDUCTIVE LOAD SWITCHING ($V_{CC} = 15\text{ V}$)						
t_{ON}	Turn-On 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	μs
t_{STG}	Storage Time			170	250	ns
t_F	Fall Time			180	250	ns
t_{ON}	Turn-On 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	μs
t_{STG}	Storage Time			140	175	ns
t_F	Fall Time			170	200	ns

Typical Performance Characteristics

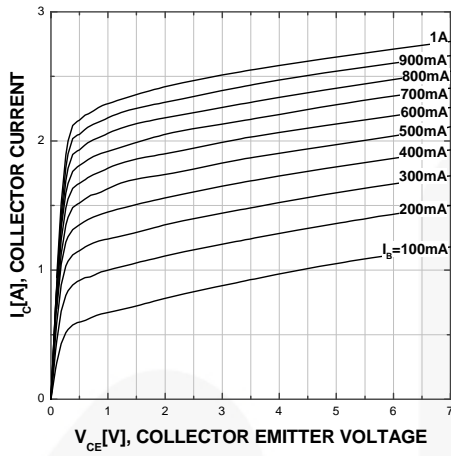


Figure 1. Static Characteristic

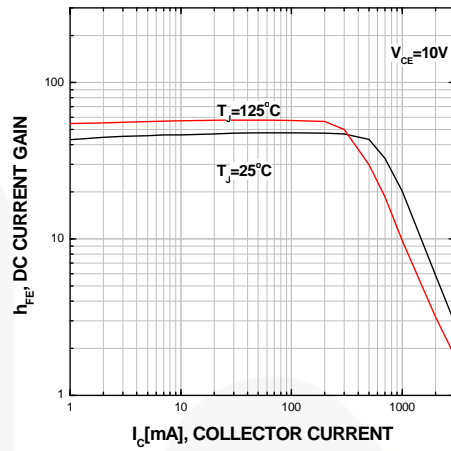


Figure 2. DC Current Gain

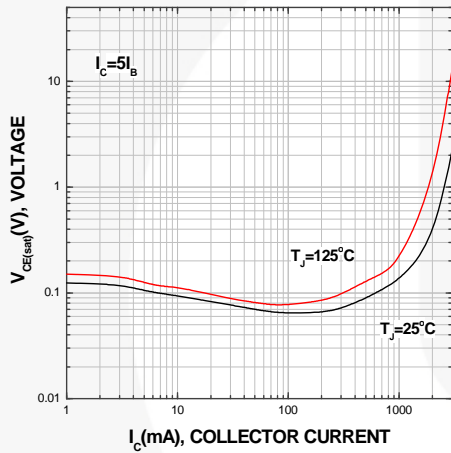


Figure 3. Collector-Emitter Saturation Voltage

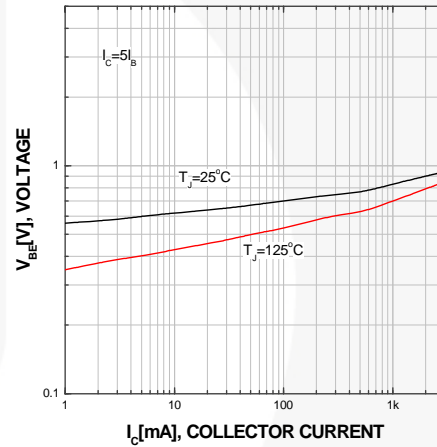


Figure 4. Base-Emitter Saturation Voltage

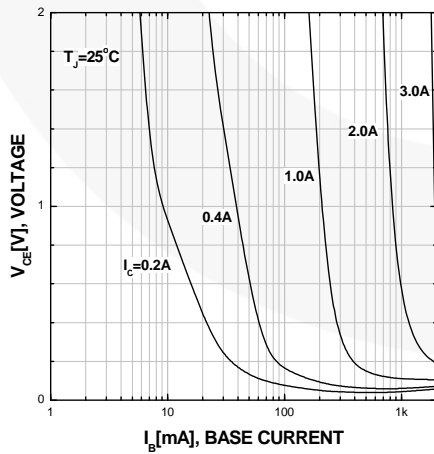


Figure 5. Typical Collector Saturation Voltage

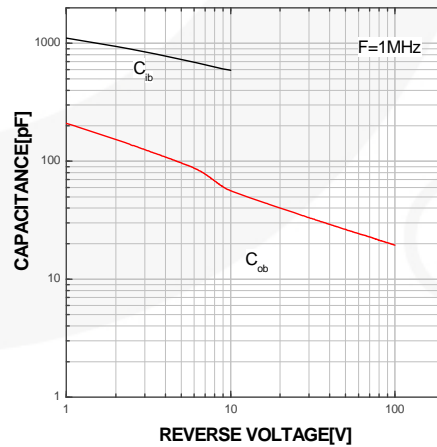


Figure 6. Capacitance

Typical Performance Characteristics (Continued)

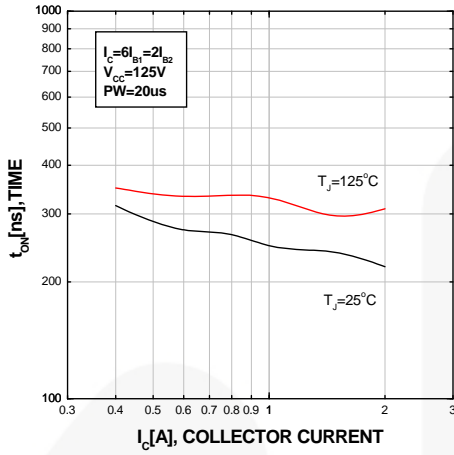


Figure 7. Resistive Switching Time, t_{on}

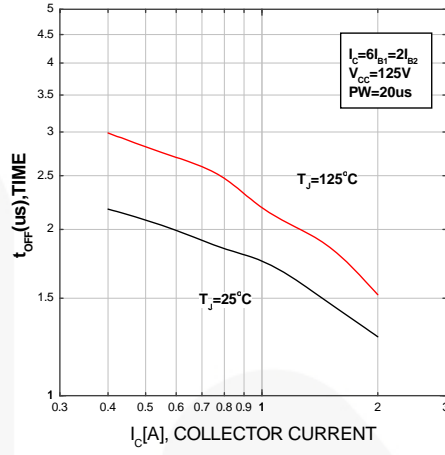


Figure 8. Resistive Switching Time, t_{off}

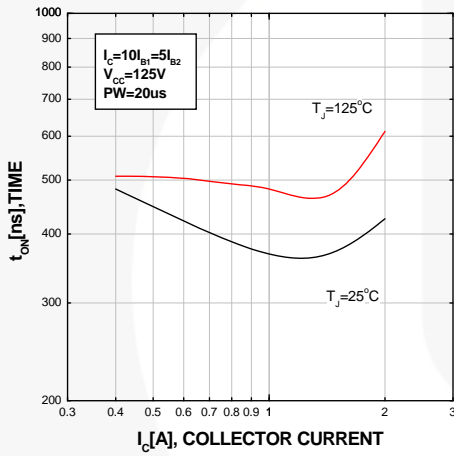


Figure 9. Resistive Switching Time, t_{on}

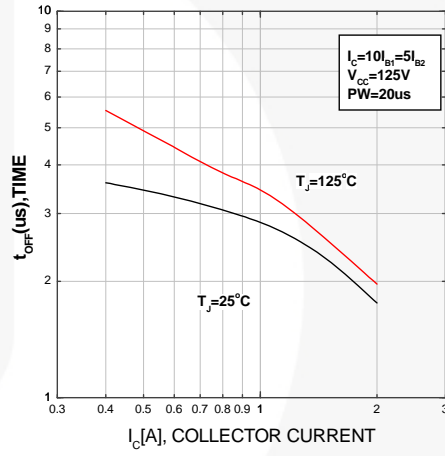


Figure 10. Resistive Switching Time, t_{off}

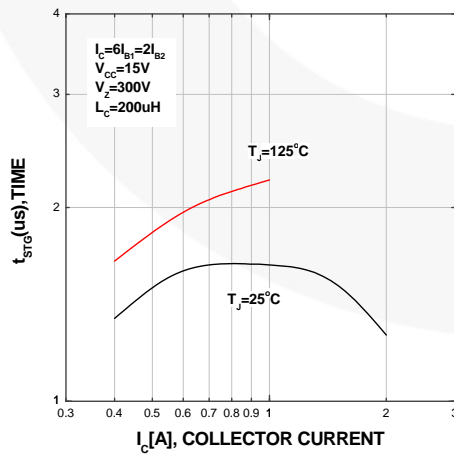


Figure 11. Inductive Switching Time, t_{STG}

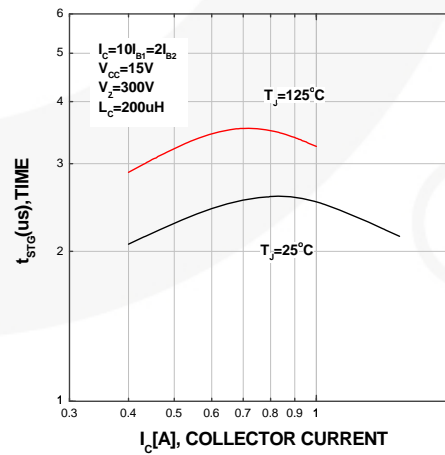


Figure 12. Inductive Switching Time, t_{STG}

Typical Performance Characteristics (Continued)

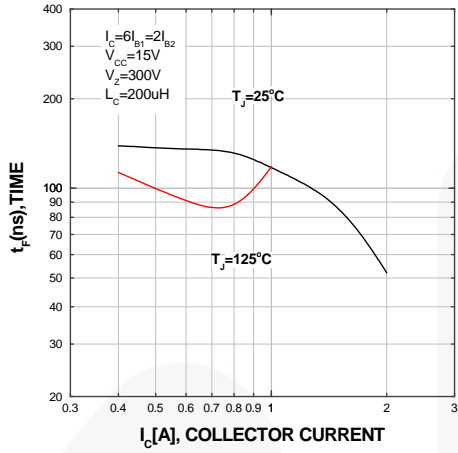


Figure 13. Inductive Switching Time, t_f

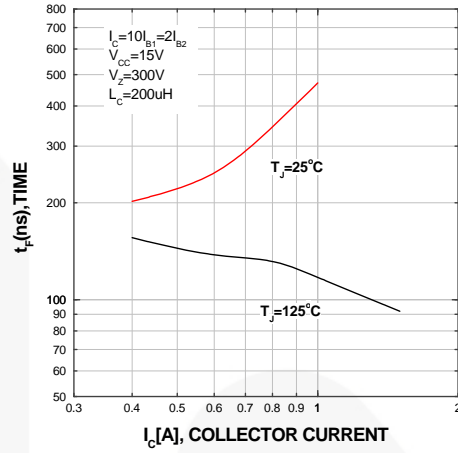


Figure 14. Inductive Switching Time, t_f

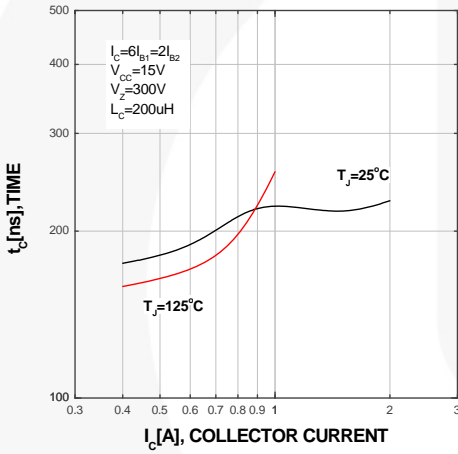


Figure 15. Inductive Switching Time, t_c

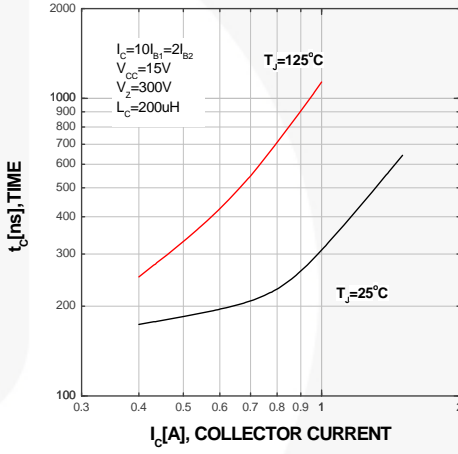


Figure 16. Inductive Switching Time, t_c

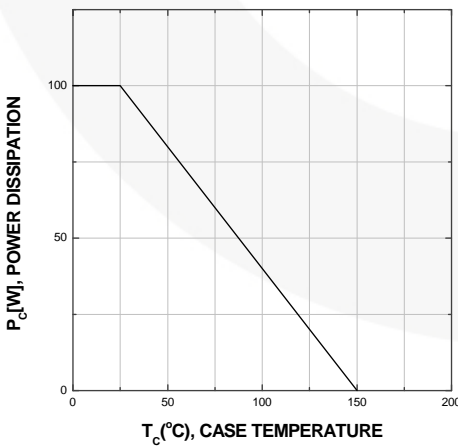
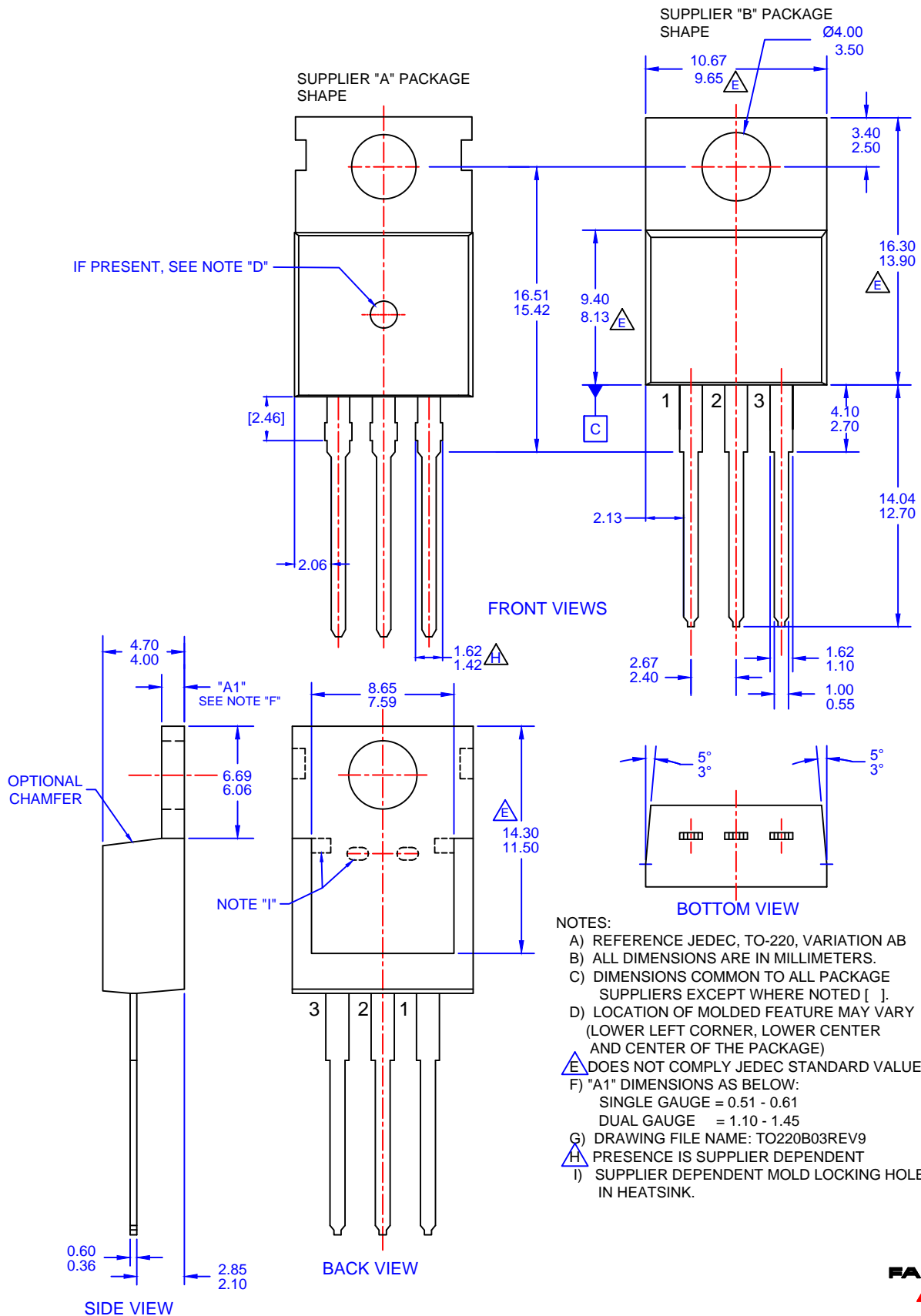


Figure 17. Power Derating



- 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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