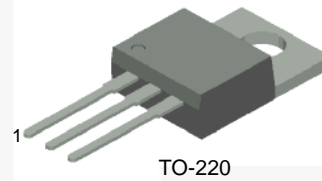


# KSC5502

## NPN Planar Silicon Transistor

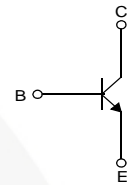
### Features

- High-Voltage Power Switch Mode Application
- Small Variance in Storage Time
- Wide Safe Operating Area
- Suitable for Electronic Ballast Application



1.Base 2.Collector 3.Emitter

Equivalent Circuit



### Ordering Information

Part Number	Marking	Package	Packing Method
KSC5502TU	J5502	TO-220	Tube

### 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	1200	V
$V_{CEO}$	Collector-Emitter Voltage	600	V
$V_{EBO}$	Emitter-Base Voltage	12	V
$I_C$	Collector Current (DC)	2	A
$I_{CP}$	Collector Current (Pulse) <sup>(1)</sup>	4	A
$I_B$	Base Current (DC)	1	A
$I_{BP}$	Base Current (Pulse) <sup>(1)</sup>	2	A
$T_J$	Junction Temperature	150	$^\circ\text{C}$
$T_{STG}$	Storage Junction Temperature Range	-65 to +150	$^\circ\text{C}$
EAS	Avalanche Energy ( $T_J = 25^\circ\text{C}$ )	2.5	mJ

#### Notes:

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

## Thermal Characteristics

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

Symbol	Parameter	Max.	Unit
$P_C$	Collector Dissipation ( $T_C = 25^\circ\text{C}$ )	50	W
$R_{\theta JC}^{(2)}$	Thermal Resistance, Junction to Case	2.5	$^\circ\text{C/W}$
$R_{\theta JA}^{(3)}$	Thermal Resistance, Junction to Ambient	85	$^\circ\text{C/W}$

### Notes:

- $R_{\theta JC}$  test fixture under infinite cooling condition.
- $R_{\theta JA}$  test board and fixture under natural convection, JE51-10 recommended thermal test board.

## Electrical Characteristics<sup>(4)</sup>

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit	
$BV_{CBO}$	Collector-Base Breakdown Voltage	$I_C = 1\text{ mA}, I_E = 0$	1200	1350		V	
$BV_{CEO}$	Collector-Emitter Breakdown Voltage	$I_C = 5\text{ mA}, I_B = 0$	600	750		V	
$BV_{EBO}$	Emitter-Base Breakdown Voltage	$I_E = 500\ \mu\text{A}, I_C = 0$	12.0	13.2		V	
$I_{CES}$	Collector Cut-Off Current	$V_{CES} = 1200\text{ V}, V_{BE} = 0$	$T_C = 25^\circ\text{C}$		100	$\mu\text{A}$	
			$T_C = 125^\circ\text{C}$		500		
$I_{CEO}$	Collector Cut-Off Current	$V_{CE} = 600\text{ V}, I_B = 0$	$T_C = 25^\circ\text{C}$		100	$\mu\text{A}$	
			$T_C = 125^\circ\text{C}$		500		
$I_{EBO}$	Emitter Cut-Off Current	$V_{EB} = 12\text{ V}, I_C = 0$	$T_C = 25^\circ\text{C}$		10	$\mu\text{A}$	
$h_{FE}$	DC Current Gain	$V_{CE} = 1\text{ V}, I_C = 0.2\text{ A}$	$T_C = 25^\circ\text{C}$	15	28	40	
			$T_C = 125^\circ\text{C}$	8	27		
		$V_{CE} = 1\text{ V}, I_C = 1\text{ A}$	$T_C = 25^\circ\text{C}$	4.0	8.7		
			$T_C = 125^\circ\text{C}$	3.0	6.6		
$V_{CE} = 2.5\text{ V}, I_C = 0.5\text{ A}$	$T_C = 25^\circ\text{C}$	12	20	30			
	$T_C = 125^\circ\text{C}$	6	16				
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 0.2\text{ A}, I_B = 0.02\text{ A}$	$T_C = 25^\circ\text{C}$		0.09	0.80	V
			$T_C = 125^\circ\text{C}$		0.13	1.10	
		$I_C = 0.4\text{ A}, I_B = 0.08\text{ A}$	$T_C = 25^\circ\text{C}$		0.08	0.60	
			$T_C = 125^\circ\text{C}$		0.12	1.00	
$I_C = 1\text{ A}, I_B = 0.2\text{ A}$	$T_C = 25^\circ\text{C}$		0.19	1.50			
	$T_C = 125^\circ\text{C}$		0.35	3.00			
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	$I_C = 0.4\text{ A}, I_B = 0.08\text{ A}$	$T_C = 25^\circ\text{C}$		0.77	1.00	V
			$T_C = 125^\circ\text{C}$		0.65	0.90	
		$I_C = 1\text{ A}, I_B = 0.2\text{ A}$	$T_C = 25^\circ\text{C}$		0.83	1.20	
			$T_C = 125^\circ\text{C}$		0.70	1.00	
$C_{ib}$	Input Capacitance	$V_{EB} = 8\text{ V}, I_C = 0, f = 1\text{ MHz}$		410	500	pF	
$C_{ob}$	Output Capacitance	$V_{CB} = 10\text{ V}, I_E = 0, f = 1\text{ MHz}$		20	100	pF	

### Note:

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

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

Symbol	Parameter	Conditions	Min	Typ.	Max.	Unit		
$V_{CE(DSAT)}$	Dynamic Saturation Voltage	$I_C = 0.4\text{ A}, I_{B1} = 80\text{ mA}, V_{CC} = 300\text{ V}$	at $1\mu\text{s}$		11	V		
			at $3\mu\text{s}$		8			
		$I_C = 1\text{ A}, I_{B1} = 200\text{ mA}, V_{CC} = 300\text{ V}$	at $1\mu\text{s}$		23			
			at $3\mu\text{s}$		13			
<b>Resistive Load Switching (<math>D.C. \leq 10\%</math>, Pulse Width = 20 s)</b>								
$t_{ON}$	Turn-On Time	$I_C = 0.4\text{ A}, I_{B1} = 80\text{ mA}, I_{B2} = 0.2\text{ A}, V_{CC} = 300\text{ V}, R_L = 750\ \Omega$	$T_C = 25^\circ\text{C}$		250	350	ns	
			$T_C = 125^\circ\text{C}$		260			
$t_{OFF}$	Turn-Off Time		$T_C = 25^\circ\text{C}$		3.3	4.0	$\mu\text{s}$	
			$T_C = 125^\circ\text{C}$		3.8			
$t_{ON}$	Turn-On Time	$I_C = 1\text{ A}, I_{B1} = 160\text{ mA}, I_{B2} = 160\text{ mA}, V_{CC} = 300\text{ V}, R_L = 300\ \Omega$	$T_C = 25^\circ\text{C}$		220	450	ns	
			$T_C = 125^\circ\text{C}$		250			
$t_{OFF}$	Turn-Off Time		$T_C = 25^\circ\text{C}$		4.3	5.0	$\mu\text{s}$	
			$T_C = 125^\circ\text{C}$		5.0			
<b>Inductive Load Switching (<math>V_{CC} = 15\text{ V}</math>)</b>								
$t_{STG}$	Storage Time	$I_C = 0.4\text{ A}, I_{B1} = 80\text{ mA}, I_{B2} = 0.2\text{ A}, V_Z = 300\text{ V}, L_C = 200\ \mu\text{H}$	$T_C = 25^\circ\text{C}$		1.4	2.0	$\mu\text{s}$	
			$T_C = 125^\circ\text{C}$		1.7			
$t_F$	Fall Time		$T_C = 25^\circ\text{C}$		130	200	ns	
			$T_C = 125^\circ\text{C}$		80			
$t_C$	Cross-Over Time		$T_C = 25^\circ\text{C}$		210	350	ns	
			$T_C = 125^\circ\text{C}$		130			
$t_{STG}$	Storage Time		$I_C = 0.8\text{ A}, I_{B1} = 160\text{ mA}, I_{B2} = 160\text{ mA}, V_{CC} = 300\text{ V}, L_C = 200\ \mu\text{H}$	$T_C = 25^\circ\text{C}$		4.9	5.5	$\mu\text{s}$
				$T_C = 125^\circ\text{C}$		5.3		
$t_F$	Fall Time	$T_C = 25^\circ\text{C}$			170	250	ns	
		$T_C = 125^\circ\text{C}$			340			
$t_C$	Cross-Over Time	$T_C = 25^\circ\text{C}$			300	600	ns	
		$T_C = 125^\circ\text{C}$			810			

### Typical Performance Characteristics

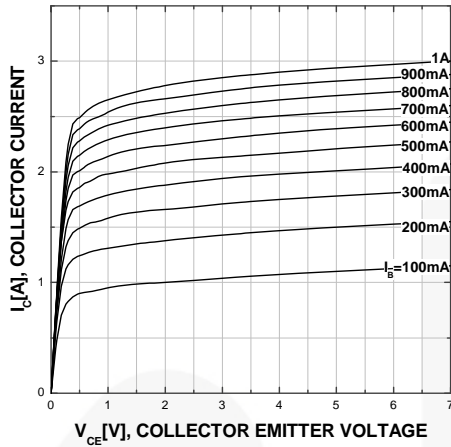


Figure 1. Static Characteristic

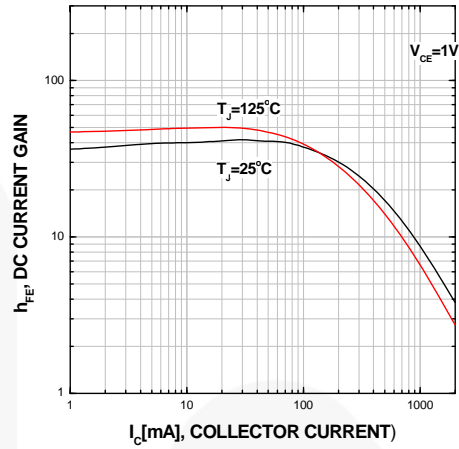


Figure 2. DC current Gain

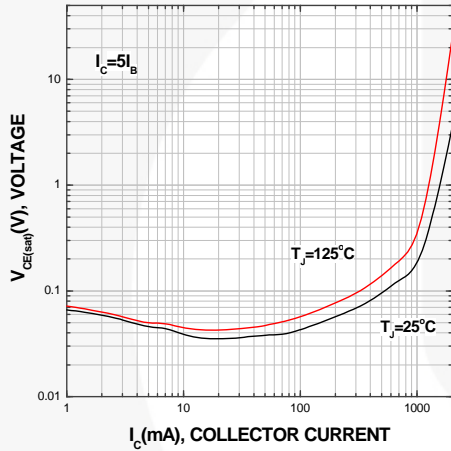


Figure 3. Collector-Emitter Saturation Voltage

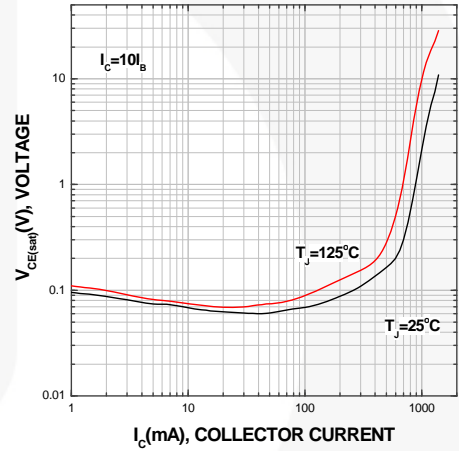


Figure 4. Collector-Emitter Saturation Voltage

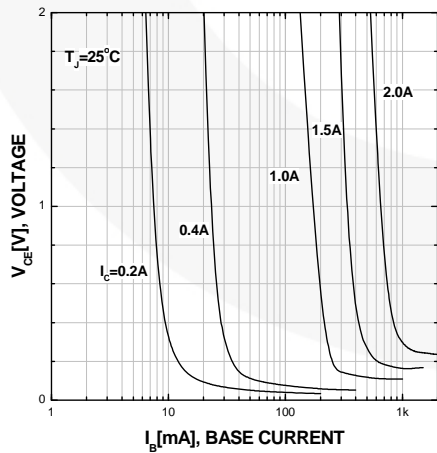


Figure 5. Typical Collector Saturation Voltage

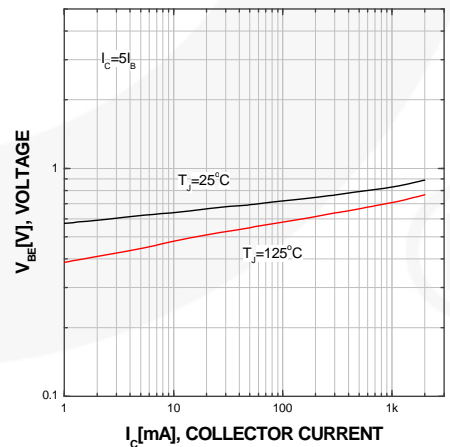


Figure 6. Base-Emitter Saturation Voltage

Typical Performance Characteristics (Continued)

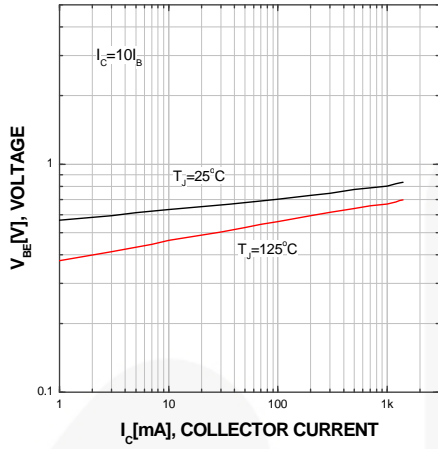


Figure 7. Base-Emitter Saturation Voltage

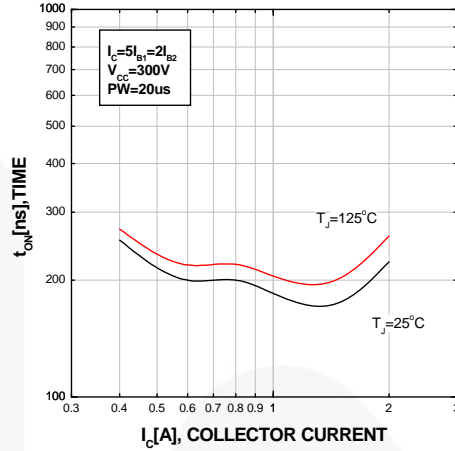


Figure 8. Resistive Switching Time,  $t_{on}$

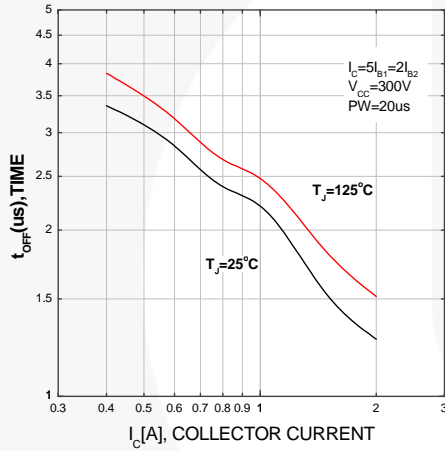


Figure 9. Resistive Switching Time,  $t_{off}$

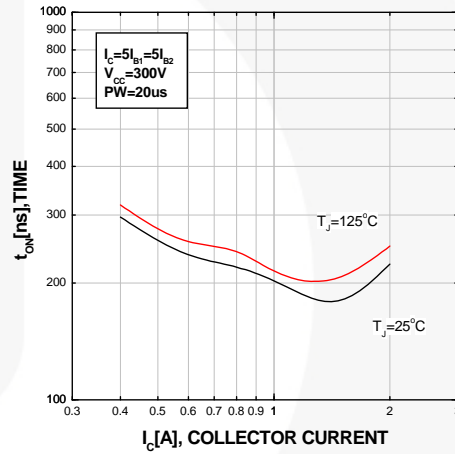


Figure 10. Resistive Switching Time,  $t_{on}$

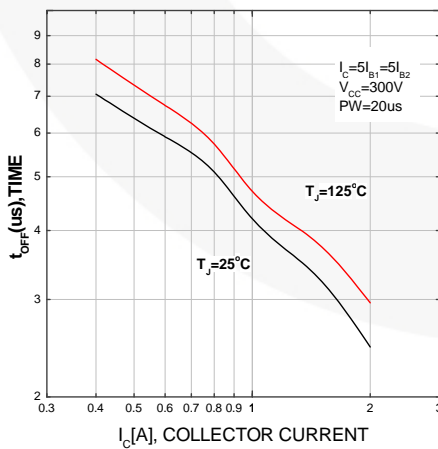


Figure 11. Resistive Switching Time,  $t_{off}$

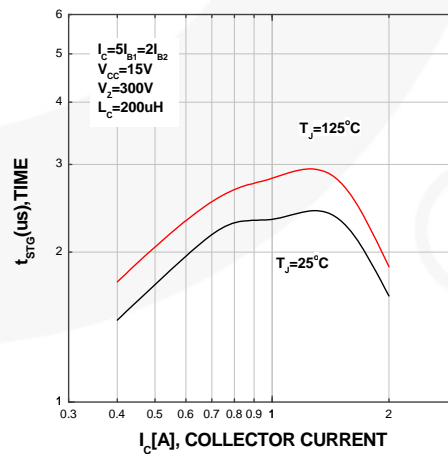
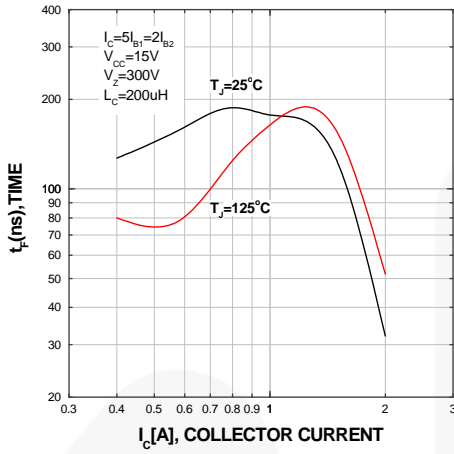
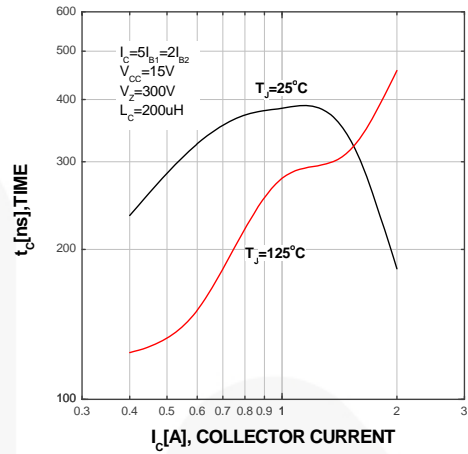


Figure 12. Inductive Switching Time,  $t_{STG}$

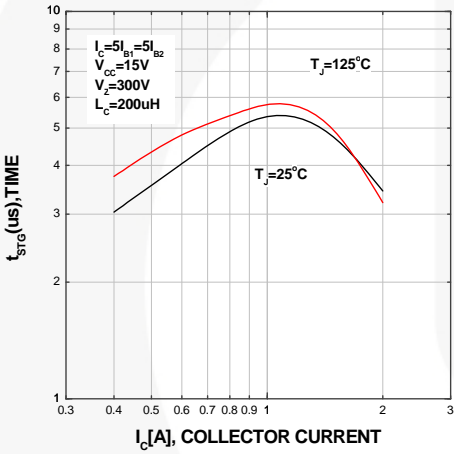
**Typical Performance Characteristics (Continued)**



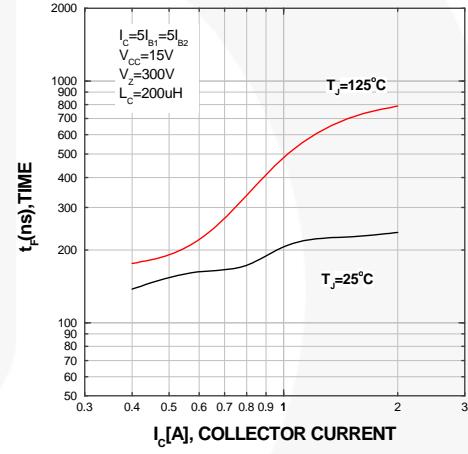
**Figure 13. Inductive Switching Time,  $t_f$**



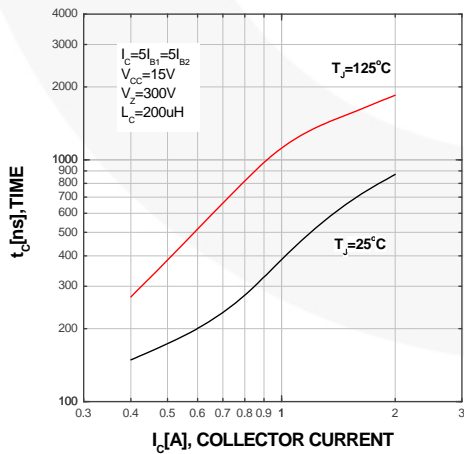
**Figure 14. Inductive Switching Time,  $t_c$**



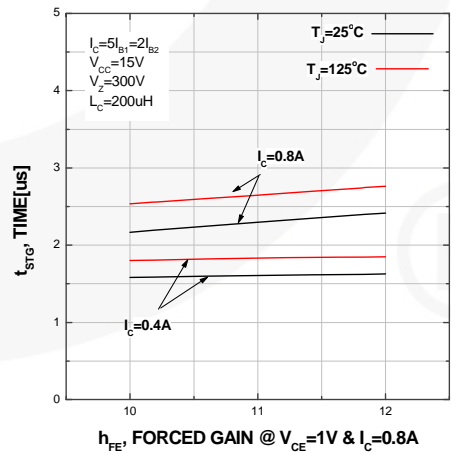
**Figure 15. Inductive Switching Time,  $t_{strG}$**



**Figure 16. Inductive Switching Time,  $t_f$**



**Figure 17. Inductive Switching Time,  $t_c$**



**Figure 18. Inductive Switching Time,  $t_{strG}$**

Typical Performance Characteristics (Continued)

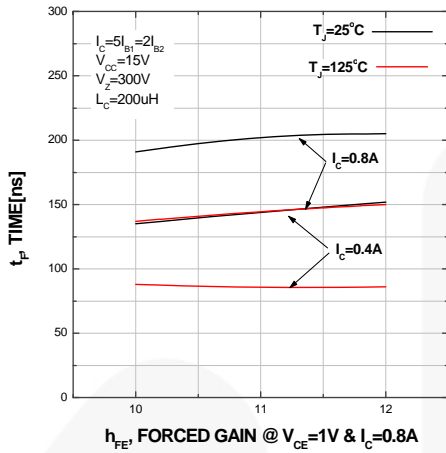


Figure 19. Inductive Switching Time,  $t_f$

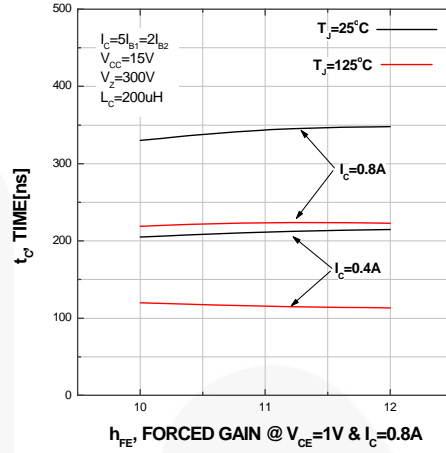


Figure 20. Inductive Switching Time,  $t_c$

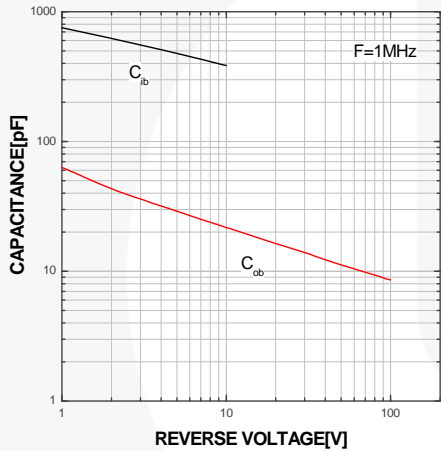


Figure 21. Capacitance

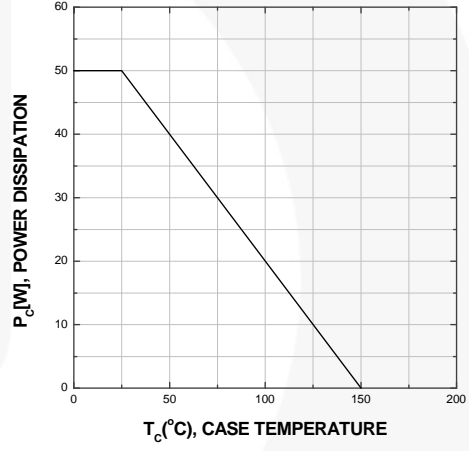
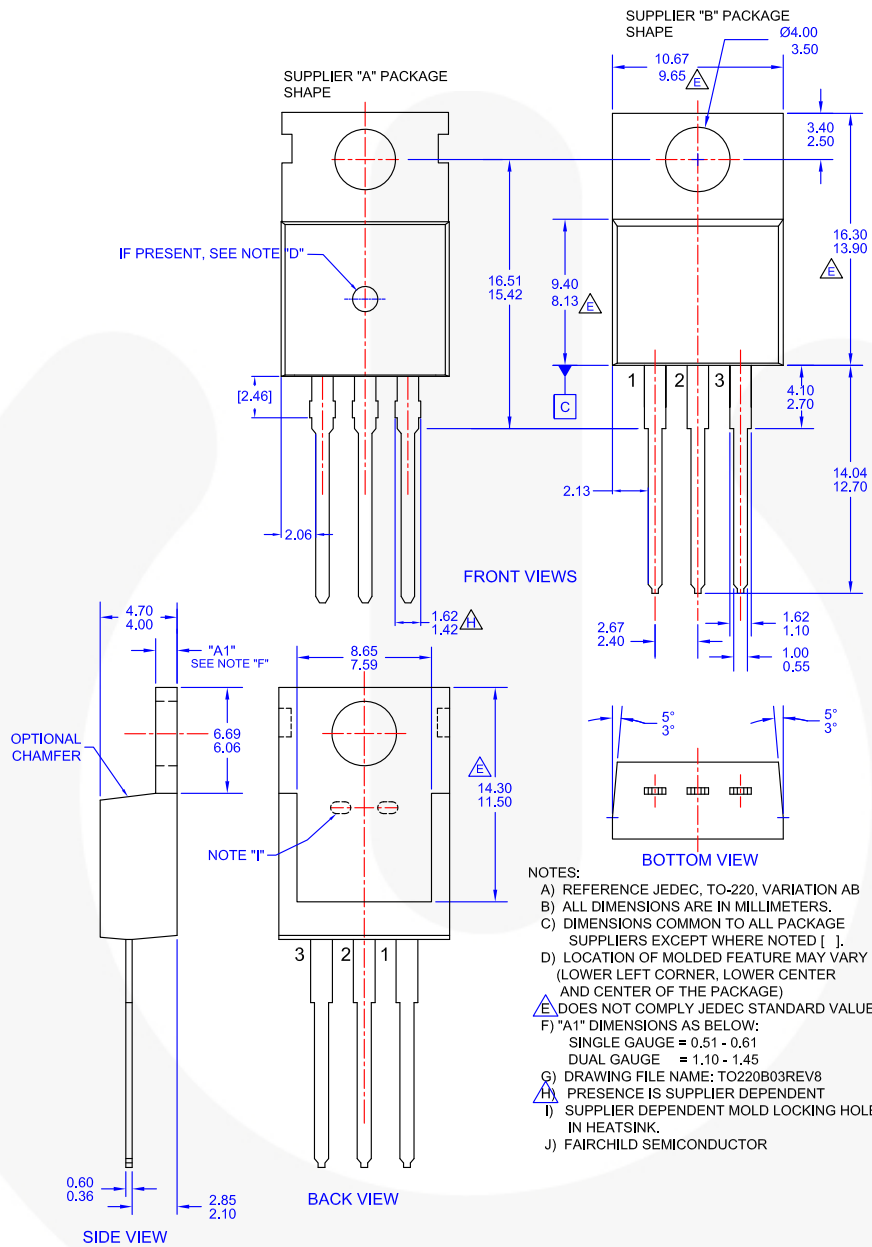


Figure 22. Power Derating

## Physical Dimensions

### TO-220



**Figure 23. TO-220, MOLDED, 3-LEAD, JEDEC VARIATION AB (ACTIVE)**

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| AX-CAP®*  | FRFET®   | PowerXS™  |  |
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| Build it Now™   | GreenBridge™                                   | PowerXS™  | TinyBuck®   |
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| CorePOWER™  | Green FPS™ e-Series™                           | QFET®   | TinyLogic®  |
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| FACT Quiet Series™  | MotionMax™                                     | SuperFET®   | UniFET™   |
| FACT®   | mWSaver®                                       | SuperSOT™-3   | VcX™  |
| FAST®   | OptoHiT™                                       | SuperSOT™-6   | VisualMax™  |
| FastvCore™  | OPTOLOGIC®                                     | SuperSOT™-8   | VoltagePlus™  |
| FETBench™   | OPTOPLANAR®                                    | SupreMOS®   | XS™   |
| FPS™  |  | SyncFET™  |   |

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