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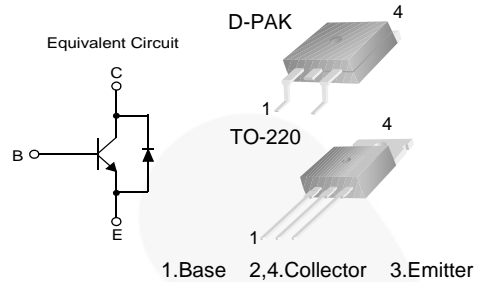
July 2014



KSC5502D / KSC5502DT NPN Triple Diffused Planar Silicon Transistor

Features

- 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 : D-PAK or TO-220



Ordering Information

Part Number	Top Mark	Package	Packing Method
KSC5502DTM	C5502D	TO-252 3L (DPAK)	Tape and Reel
KSC5502DTTU	C5502D	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 $T_C = 25^\circ\text{C}$ 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) ⁽¹⁾	4	A
I_B	Base Current (DC)	1	A
I_{BP}	Base Current (Pulse) ⁽¹⁾	2	A
T_J	Junction Temperature	150	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-65 to 150	$^\circ\text{C}$
EAS	Avalanche Energy ($T_J = 25^\circ\text{C}$)	2.5	mJ

Note:

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

KSC5502D / KSC5502DT — NPN Triple Diffused Planar Silicon Transistor

Thermal Characteristics

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

Symbol	Parameter	KSC5502D (D-PAK)	KSC5502DT (TO-220)	Unit
P_C	Collector Dissipation ($T_C = 25^\circ\text{C}$)	87.83	118.16	W
$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.42	1.06	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	111.0	62.5	$^\circ\text{C}/\text{W}$
T_L	Maximum Lead Temperature for Soldering Purpose: 1/8 inch from Case for 5 seconds	270		$^\circ\text{C}$

Electrical Characteristics

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	$I_E = 500\text{ }\mu\text{A}, I_C = 0$	12.0	13.7		V	
I_{CES}	Collector Cut-off Current	$V_{CES} = 1200\text{ V}, V_{BE} = 0$	$T_C = 25^\circ\text{C}$		100	μA	
			$T_C = 125^\circ\text{C}$		500		
I_{CEO}	Collector Cut-off Current	$V_{CE} = 600\text{ V}, I_B = 0$	$T_C = 25^\circ\text{C}$		100	μA	
			$T_C = 125^\circ\text{C}$		500		
I_{EBO}	Emitter Cut-off Current	$V_{EB} = 12\text{ V}, I_C = 0$	$T_C = 25^\circ\text{C}$		10	μA	
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	18		
		$V_{CE} = 1\text{ V}, I_C = 1\text{ A}$	$T_C = 25^\circ\text{C}$	4.0	6.4		
			$T_C = 125^\circ\text{C}$	3.0	4.7		
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 0.2\text{ A}, I_B = 0.02\text{ A}$	$T_C = 25^\circ\text{C}$		0.31	0.80	V
			$T_C = 125^\circ\text{C}$		0.54	1.10	
		$I_C = 0.4\text{ A}, I_B = 0.08\text{ A}$	$T_C = 25^\circ\text{C}$		0.15	0.60	
			$T_C = 125^\circ\text{C}$		0.23	1.00	
$V_{BE(sat)}$	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
			$T_C = 125^\circ\text{C}$		0.60	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	$V_{EB} = 8\text{ V}, I_C = 0, f = 1\text{ MHz}$		385	500	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	$I_F = 0.2\text{ A}$	$T_C = 25^\circ\text{C}$		0.75	1.20	V
			$T_C = 125^\circ\text{C}$		0.59		
		$I_F = 0.4\text{ A}$	$T_C = 25^\circ\text{C}$		0.80	1.30	
			$T_C = 125^\circ\text{C}$		0.64		
		$I_F = 1\text{ A}$	$T_C = 25^\circ\text{C}$		0.90	1.50	

Electrical Characteristics

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

Symbol	Parameter	Conditions	Min	Typ.	Max.	Unit
t_{fr}	Diode Forward Recovery Time ($di/dt=10\text{ A}/\mu\text{s}$)	$I_F = 0.2\text{ A}$		650		ns
		$I_F = 0.4\text{ A}$		740		
		$I_F = 1\text{ A}$		785		
$V_{CE(DSAT)}$	Dynamic Saturation Voltage	$I_C = 0.4\text{ A}, I_{B1} = 80\text{ mA}, V_{CC} = 300\text{ V}$	at $1\ \mu\text{s}$	7.2		V
			at $3\ \mu\text{s}$	1.8		
		$I_C = 1\text{ A}, I_{B1} = 200\text{ mA}, V_{CC} = 300\text{ V}$	at $1\ \mu\text{s}$	18.0		
			at $3\ \mu\text{s}$	6.0		
Resistive Load Switching ($D.C < 10\%$, Pulse Width = 20 s)						
t_{ON}	Turn-On Time	$I_C = 0.4\text{ A}, I_{B1} = 80\text{ mA}, I_{B2} = 0.2\text{ A}, V_{CC} = 300\text{ V}, R_L = 750\ \Omega$	$T_C = 25^\circ\text{C}$	175	350	ns
			$T_C = 125^\circ\text{C}$	185		
t_{OFF}	Turn-Off Time	$I_C = 0.4\text{ A}, I_{B1} = 80\text{ mA}, I_{B2} = 0.2\text{ A}, V_{CC} = 300\text{ V}, R_L = 750\ \Omega$	$T_C = 25^\circ\text{C}$	2.1	3.0	μs
			$T_C = 125^\circ\text{C}$	2.6		
t_{ON}	Turn-On Time	$I_C = 1\text{ A}, I_{B1} = 160\text{ mA}, I_{B2} = 160\text{ mA}, V_{CC} = 300\text{ V}, R_L = 300\ \Omega$	$T_C = 25^\circ\text{C}$	240	450	ns
			$T_C = 125^\circ\text{C}$	310		
t_{OFF}	Turn-Off Time	$I_C = 1\text{ A}, I_{B1} = 160\text{ mA}, I_{B2} = 160\text{ mA}, V_{CC} = 300\text{ V}, R_L = 300\ \Omega$	$T_C = 25^\circ\text{C}$	3.7	5.0	μs
			$T_C = 125^\circ\text{C}$	4.5		
Inductive Load Switching ($V_{CC} = 15\text{ V}$)						
t_{STG}	Storage Time	$I_C = 0.4\text{ A}, I_{B1} = 80\text{ mA}, I_{B2} = 0.2\text{ A}, V_Z = 300\text{ V}, L_C = 200\text{ H}$	$T_C = 25^\circ\text{C}$	1.2	2.0	μs
			$T_C = 125^\circ\text{C}$	1.5		
t_F	Fall Time	$I_C = 0.4\text{ A}, I_{B1} = 80\text{ mA}, I_{B2} = 0.2\text{ A}, V_Z = 300\text{ V}, L_C = 200\text{ H}$	$T_C = 25^\circ\text{C}$	90	200	ns
			$T_C = 125^\circ\text{C}$	65		
t_C	Cross-Over Time	$I_C = 0.4\text{ A}, I_{B1} = 80\text{ mA}, I_{B2} = 0.2\text{ A}, V_Z = 300\text{ V}, L_C = 200\text{ H}$	$T_C = 25^\circ\text{C}$	185	350	ns
			$T_C = 125^\circ\text{C}$	145		
t_{STG}	Storage Time	$I_C = 0.8\text{ A}, I_{B1} = 160\text{ mA}, I_{B2} = 160\text{ mA}, V_{CC} = 300\text{ V}, L_C = 200\text{ H}$	$T_C = 25^\circ\text{C}$	3.30	4.50	μs
			$T_C = 125^\circ\text{C}$	3.75		
t_F	Fall Time	$I_C = 0.8\text{ A}, I_{B1} = 160\text{ mA}, I_{B2} = 160\text{ mA}, V_{CC} = 300\text{ V}, L_C = 200\text{ H}$	$T_C = 25^\circ\text{C}$	90	250	ns
			$T_C = 125^\circ\text{C}$	160		
t_C	Cross-over Time	$I_C = 0.8\text{ A}, I_{B1} = 160\text{ mA}, I_{B2} = 160\text{ mA}, V_{CC} = 300\text{ V}, L_C = 200\text{ H}$	$T_C = 25^\circ\text{C}$	300	600	ns
			$T_C = 125^\circ\text{C}$	570		

Typical Performance Characteristics

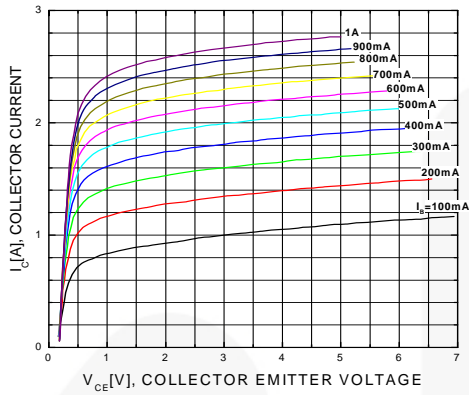


Figure 1. Static Characteristic

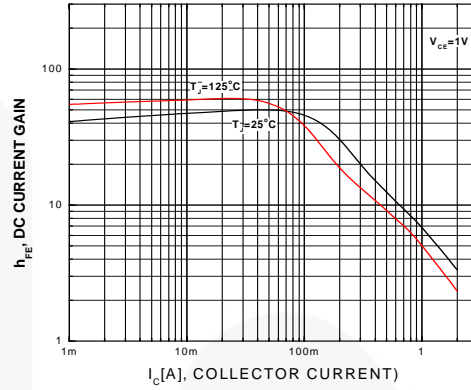


Figure 2. DC Current Gain

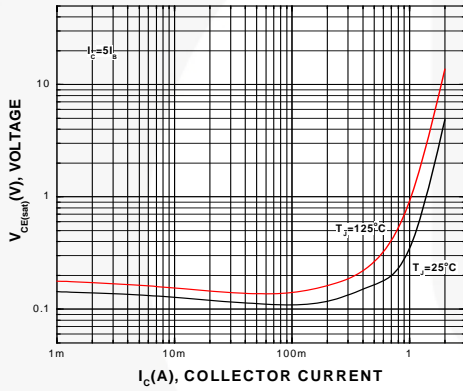


Figure 3. Collector-Emitter Saturation Voltage

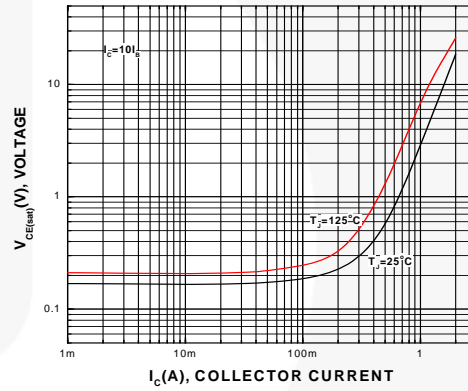


Figure 4. Collector-Emitter Saturation Voltage

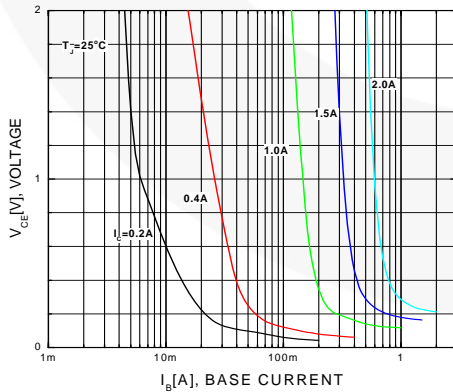


Figure 5. Typical Collector Saturation Voltage

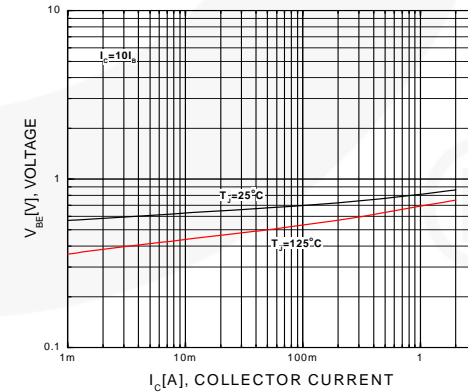


Figure 6. Base-Emitter Saturation Voltage

Typical Performance Characteristics (Continued)

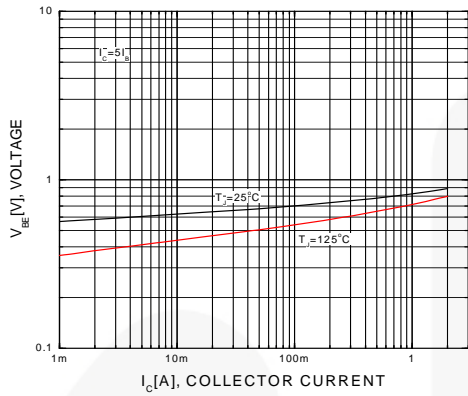


Figure 7. Base-Emitter Saturation Voltage

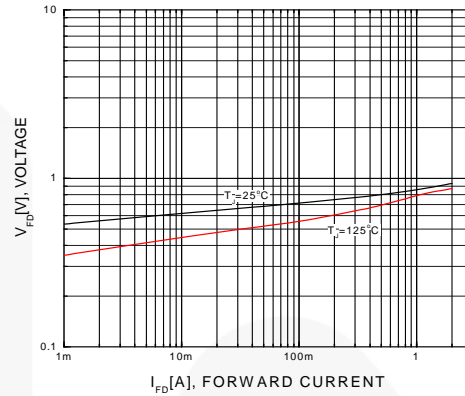


Figure 8. Diode Forward Voltage

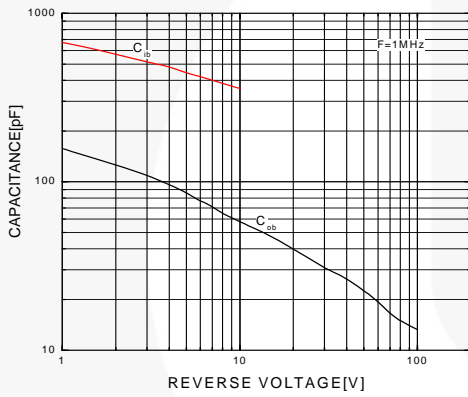


Figure 9. Collector Output Capacitance

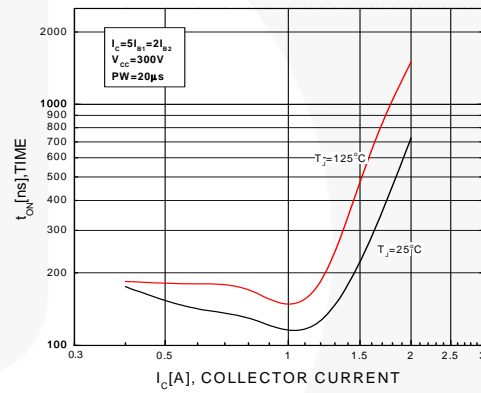


Figure 10. Resistive Switching Time, t_{on}

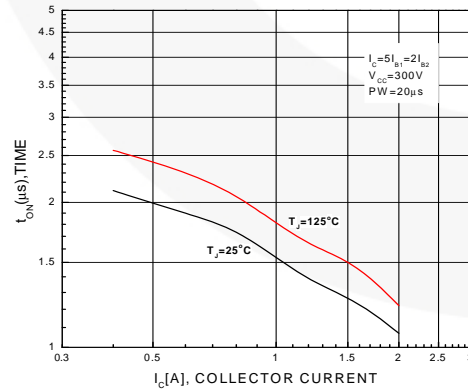


Figure 11. Resistive Switching Time, t_{off}

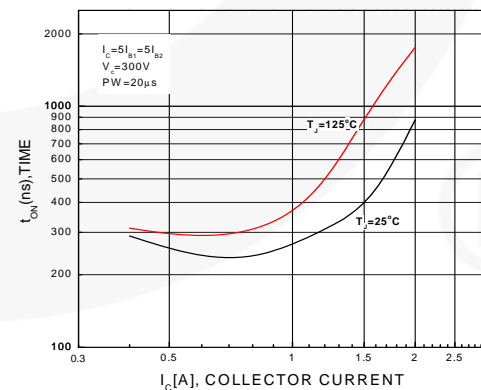


Figure 12. Resistive Switching Time, t_{on}

Typical Performance Characteristics (Continued)

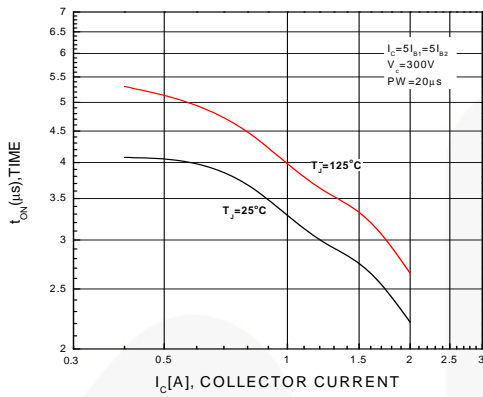


Figure 13. Resistive Switching Time, t_{off}

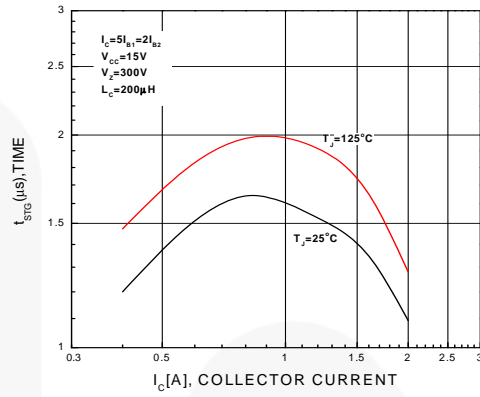


Figure 14. Inductive Switching Time, t_{STG}

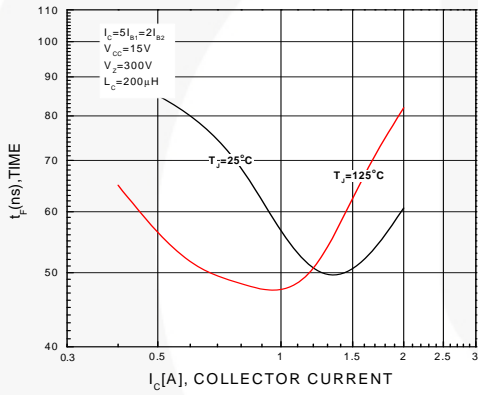


Figure 15. Inductive Switching Time, t_f

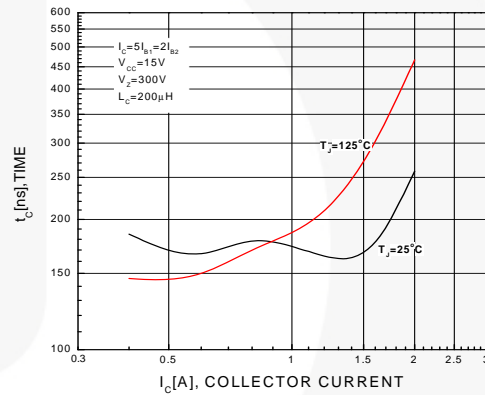


Figure 16. Inductive Switching Time, t_c

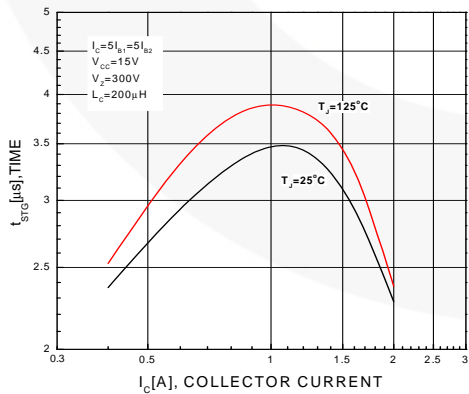


Figure 17. Inductive Switching Time, t_{STG}

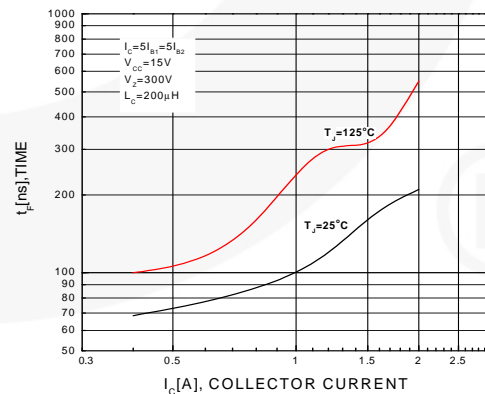


Figure 18. Inductive Switching Time, t_f

Typical Performance Characteristics (Continued)

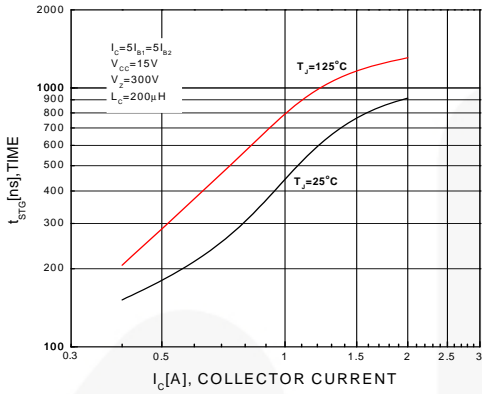


Figure 19. Inductive Switching Time, t_{STG}

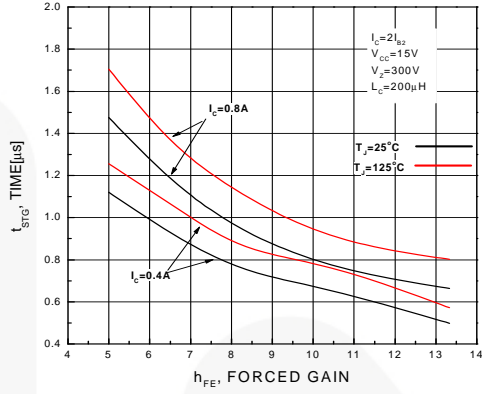


Figure 20. Inductive Switching Time, t_{STG}

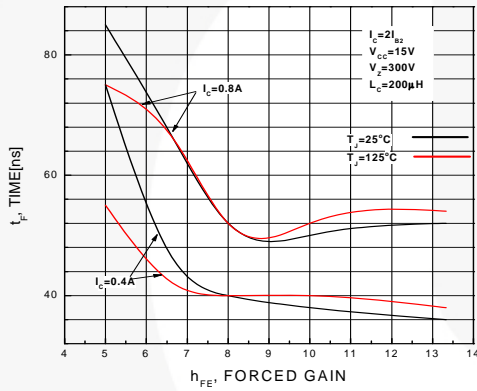


Figure 21. Inductive Switching Time, t_F

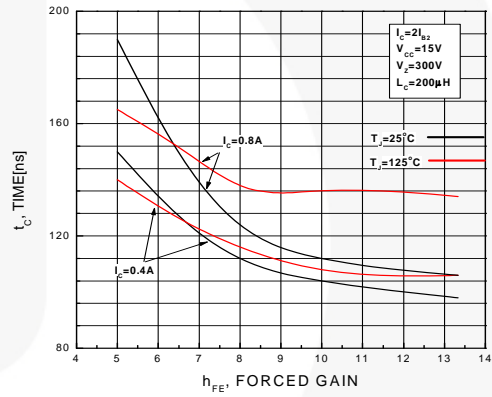


Figure 22. Inductive Switching Time, t_C

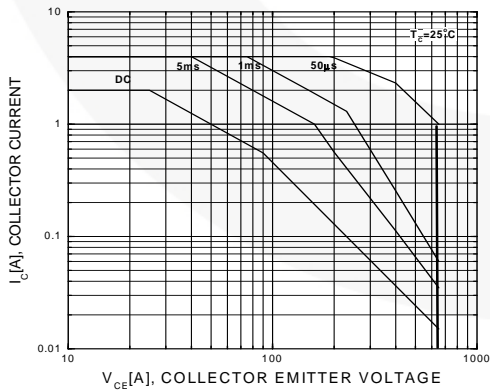


Figure 23. Forward Bias Safe Operating Area

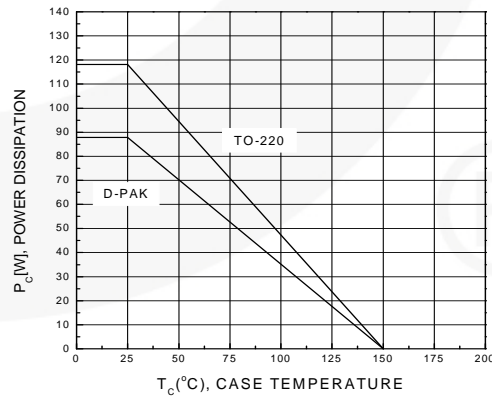


Figure 24. Power Derating

Typical Performance Characteristics (Continued)

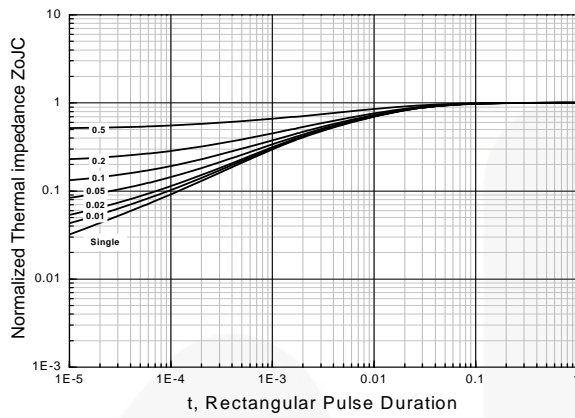


Figure 25. ZoJC, Transient Thermal Impedance (D-PAK)

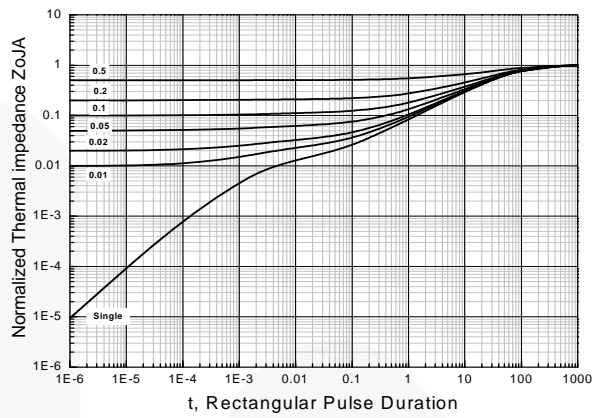


Figure 26. ZoJA, Transient Thermal Impedance (D-PAK)

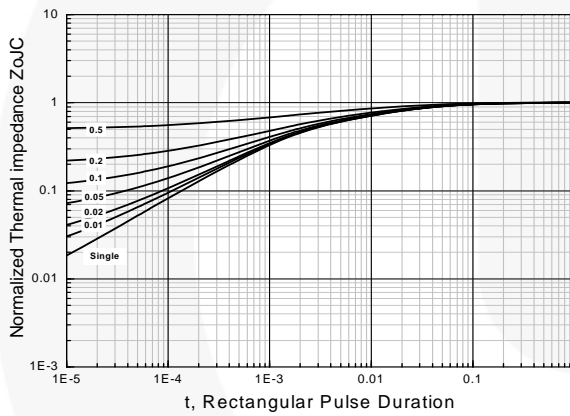


Figure 27. ZoJC, Transient Thermal Impedance (TO-220)

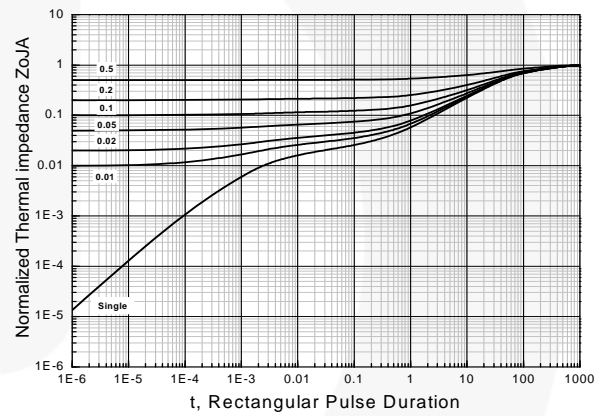


Figure 28. ZoJA, Transient Thermal Impedance (TO-220)

Physical Dimensions

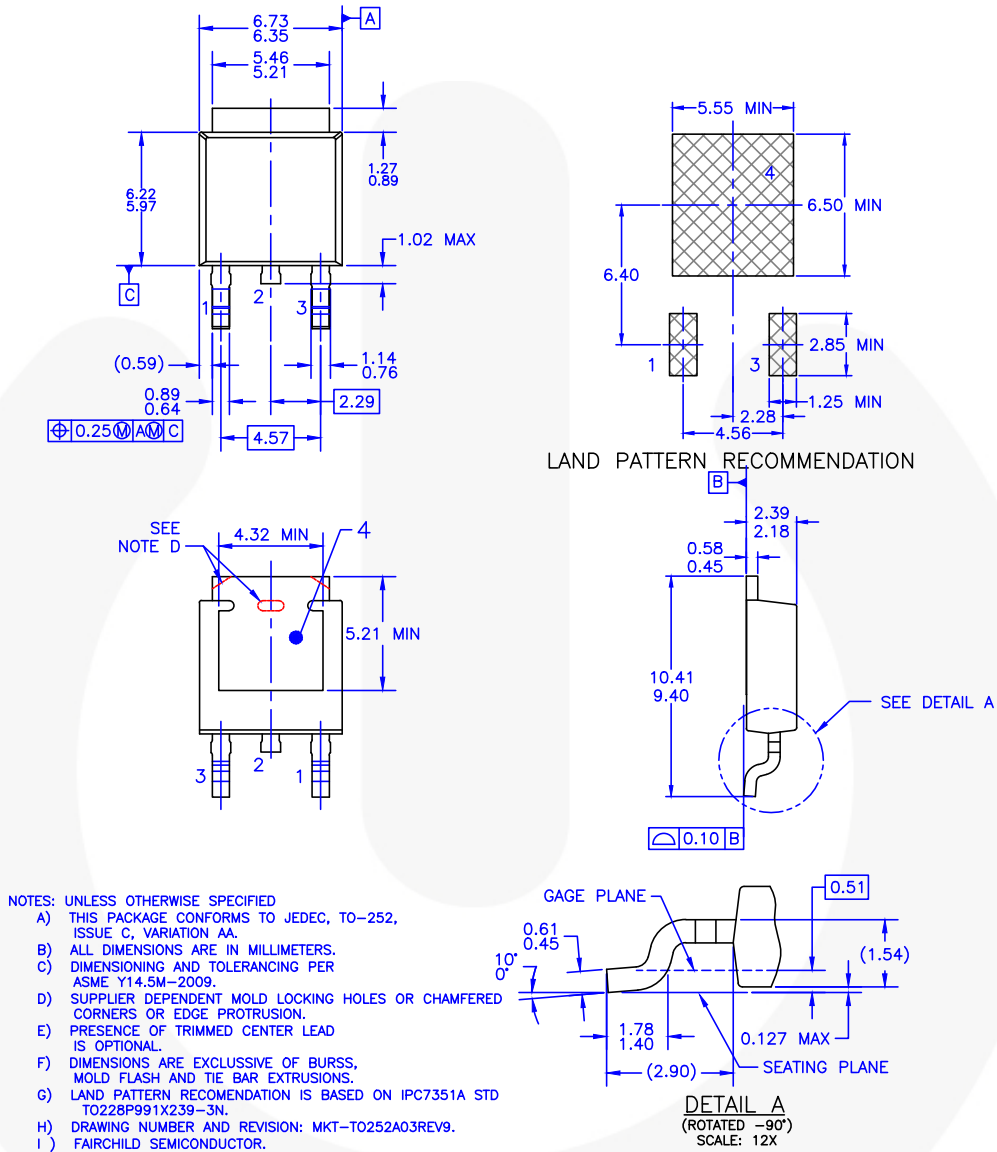


Figure 29. TO-252 (D-PAK), MOLDED, 3-LEAD, OPTION AA & AB

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Physical Dimensions

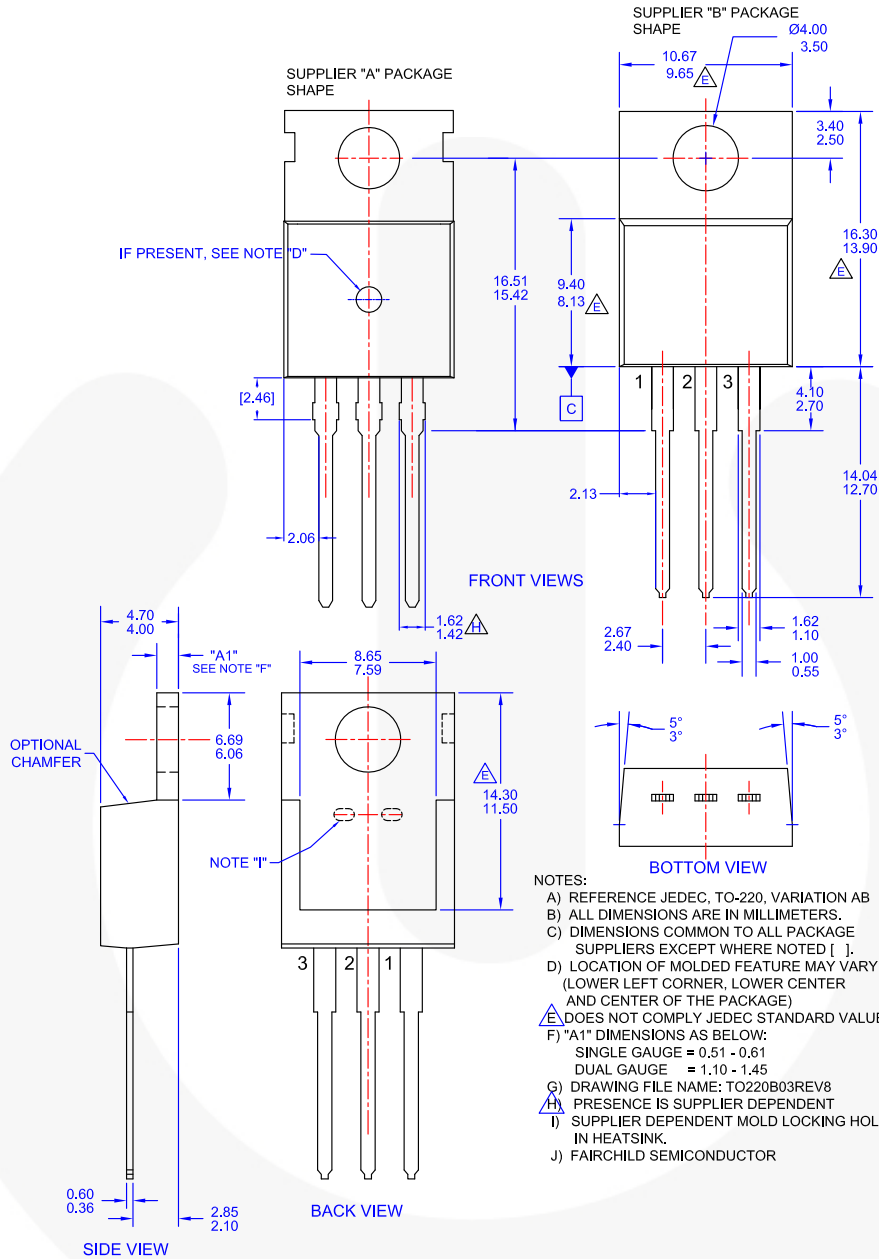


Figure 30. TO-220, MOLDED, 3LEAD, JEDEC VARIATION AB

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