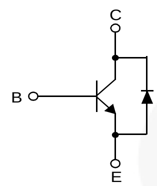
July 2014

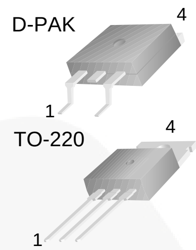
KSC5502D / KSC5502DT
NPN Triple Diffused Planar Silicon Transistor

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

Equivalent Circuit





1.Base 2,4.Collector 3.Emitter

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°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	°C
T_{STG}	Storage Temperature Range	-65 to 150	°C
EAS	Avalanche Energy (T_J = 25°C)	2.5	mJ

Note:

1. Pulse test: Pulse width = 5 ms, duty cycle ≤ 10%.

Thermal Characteristics

Values are at T_C = 25°C unless otherwise noted.

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

Electrical Characteristics

Values are at T_C = 25°C unless otherwise noted.

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Unit
BV_{CBO}	Collector-Base Breakdown Voltage	I_C = 1 mA, I_E = 0		1200	1350		V
BV_{CEO}	Collector-Emitter Breakdown Voltage	I_C = 5 mA, I_B = 0		600	750		V
BV_{EBO}	Emitter-Base Breakdown Voltage	I_E = 500 µA, I_C = 0		12.0	13.7		V
I_{CES}	Collector Cut-off Current	V_{CES} = 1200 V, V_{BE} = 0	T_C = 25°C			100	µA
			T_C = 125°C			500	
I_{CEO}	Collector Cut-off Current	V_{CE} = 600 V, I_B = 0	T_C = 25°C			100	µA
			T_C = 125°C			500	
I_{EBO}	Emitter Cut-off Current	V_{EB} = 12 V, I_C = 0	T_C = 25°C			10	µA
h_{FE}	DC Current Gain	V_{CE} = 1 V, I_C = 0.2 A	T_C = 25°C	15	28	40	
			T_C = 125°C	8	18		
		V_{CE} = 1 V, I_C = 1 A	T_C = 25°C	4.0	6.4		
			T_C = 125°C	3.0	4.7		
		V_{CE} = 2.5 V, I_C = 0.5 A	T_C = 25°C	12	20	30	
			T_C = 125°C	6	12		
V_{CE}(sat)	Collector-Emitter Saturation Voltage	I_C = 0.2 A, I_B = 0.02 A	T_C = 25°C		0.31	0.80	V
			T_C = 125°C		0.54	1.10	
		I_C = 0.4 A, I_B = 0.08 A	T_C = 25°C		0.15	0.60	
			T_C = 125°C		0.23	1.00	
		I_C = 1 A, I_B = 0.2 A	T_C = 25°C		0.40	1.50	
			T_C = 125°C		1.30	3.00	
V_{BE}(sat)	Base-Emitter Saturation Voltage	I_C = 0.4 A, I_B = 0.08 A	T_C = 25°C		0.77	1.00	V
			T_C = 125°C		0.60	0.90	
		I_C = 1 A, I_B = 0.2 A	T_C = 25°C		0.83	1.20	
			T_C = 125°C		0.70	1.00	
C_{ib}	Input Capacitance	V_{EB} = 8 V, I_C = 0, f = 1 MHz			385	500	pF
C_{ob}	Output Capacitance	V_{CB} = 10 V, I_E = 0, f = 1 MHz			60	100	pF
f_T	Current Gain Bandwidth Product	I_C = 0.5 A, V_{CE} = 10 V			11		MHz
V_F	Diode Forward Voltage	I_F = 0.2 A	T_C = 25°C		0.75	1.20	V
			T_C = 125°C		0.59		
		I_F = 0.4 A	T_C = 25°C		0.80	1.30	
			T_C = 125°C		0.64		
		I_F = 1 A	T_C = 25°C		0.90	1.50	

Electrical Characteristics

Values are at T_C = 25°C unless otherwise noted.

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

Typical Performance Characteristics

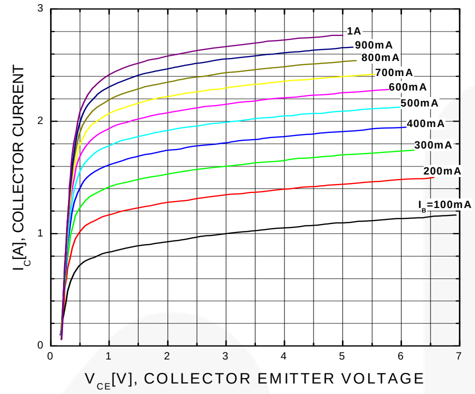


Figure 1. Static Characteristic

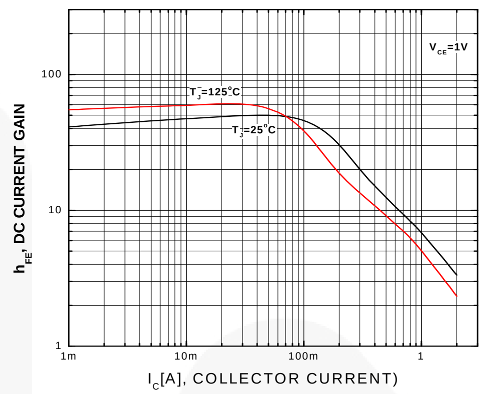


Figure 2. DC Current Gain

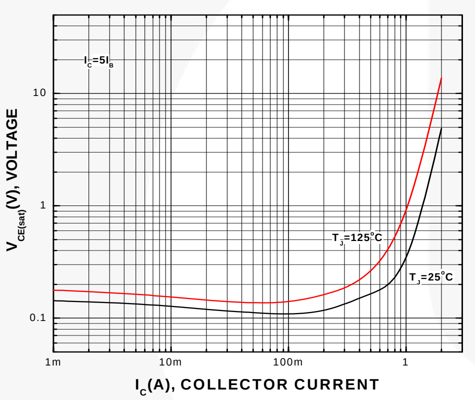


Figure 3. Collector-Emitter Saturation Voltage

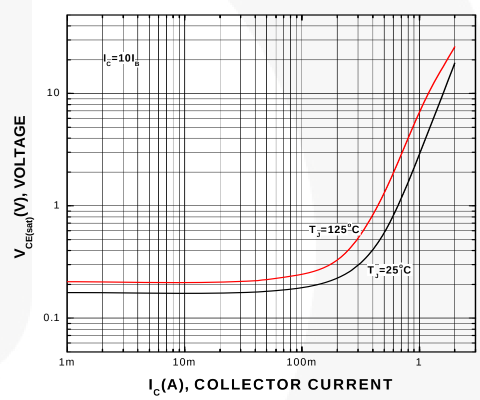


Figure 4. Collector-Emitter Saturation Voltage

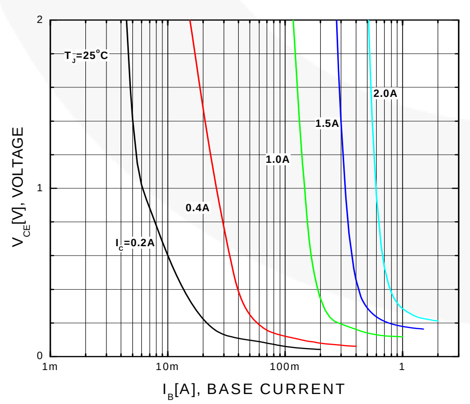


Figure 5. Typical Collector Saturation Voltage

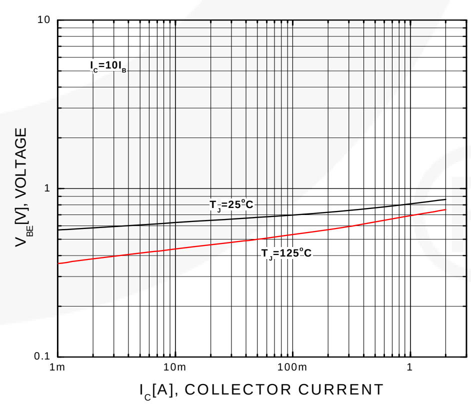


Figure 6. Base-Emitter Saturation Voltage

Typical Performance Characteristics (Continued)

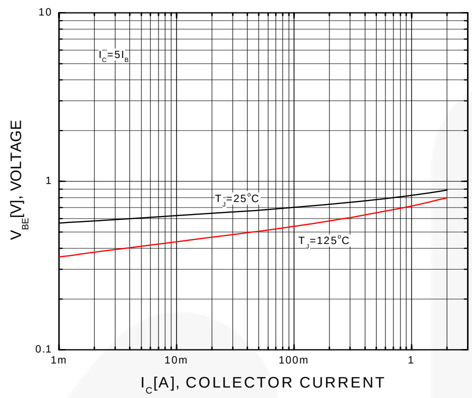


Figure 7. Base-Emitter Saturation Voltage

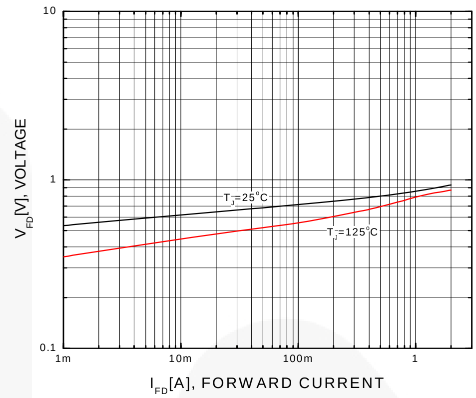


Figure 8. Diode Forward Voltage

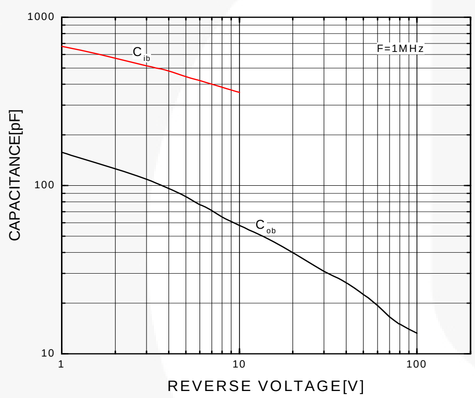


Figure 9. Collector Output Capacitance

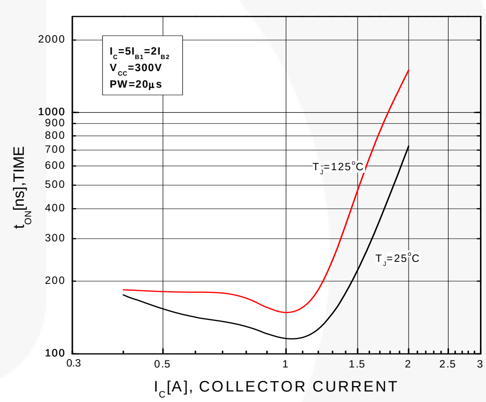


Figure 10. Resistive Switching Time, t_{on}

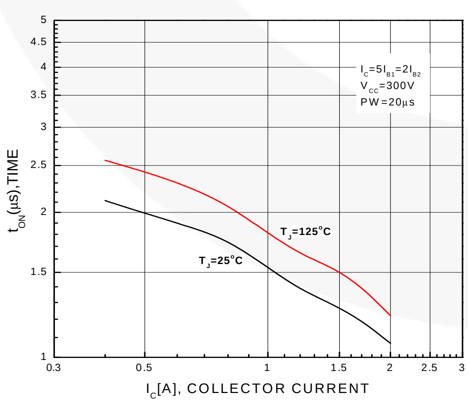


Figure 11. Resistive Switching Time, t_{off}

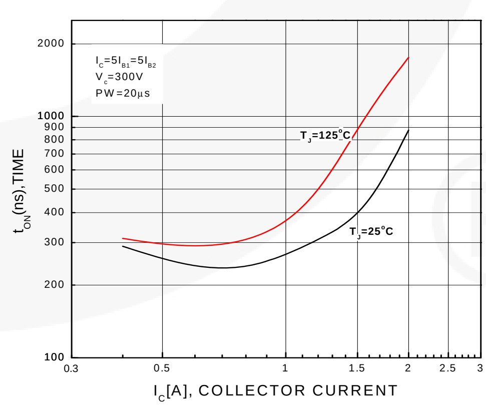


Figure 12. Resistive Switching Time, t_{on}

Typical Performance Characteristics (Continued)

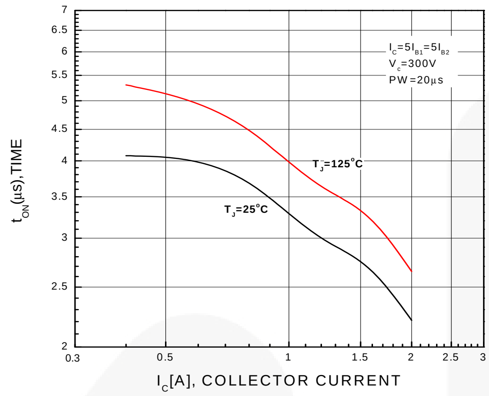


Figure 13. Resistive Switching Time, t_{off}

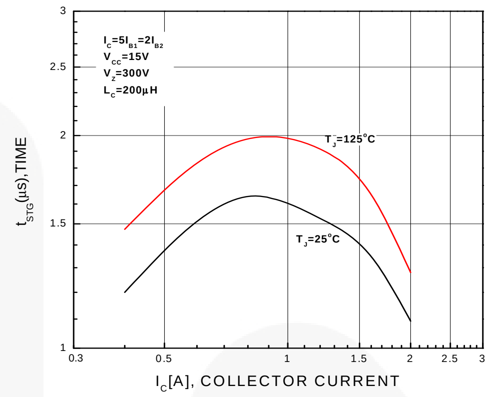


Figure 14. Inductive Switching Time, t_{STG}

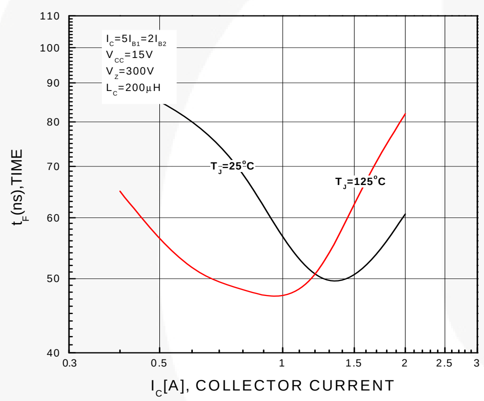


Figure 15. Inductive Switching Time, t_F

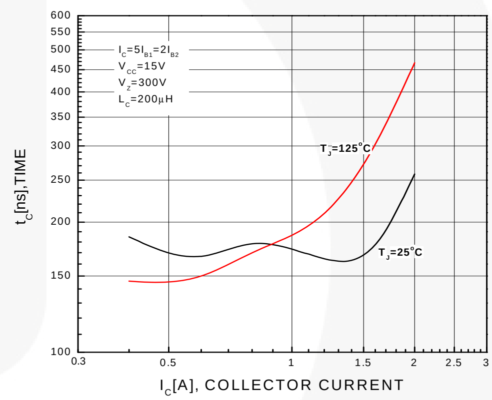


Figure 16. Inductive Switching Time, t_c

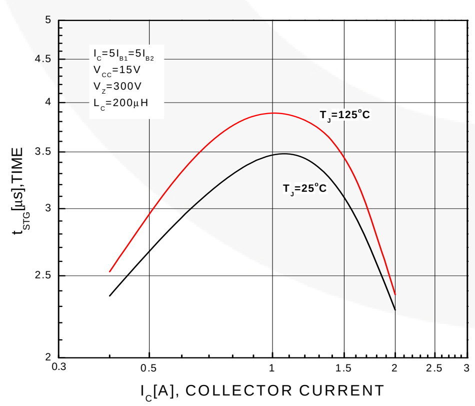


Figure 17. Inductive Switching Time, t_{STG}

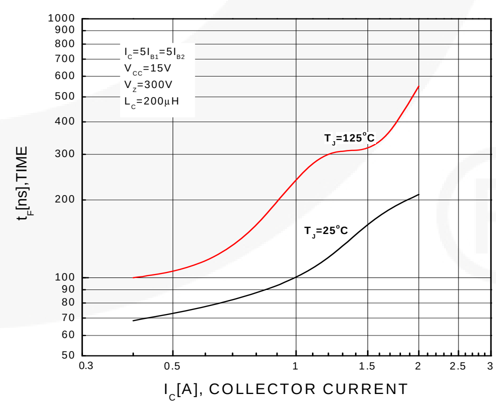


Figure 18. Inductive Switching Time, t_F

Typical Performance Characteristics (Continued)

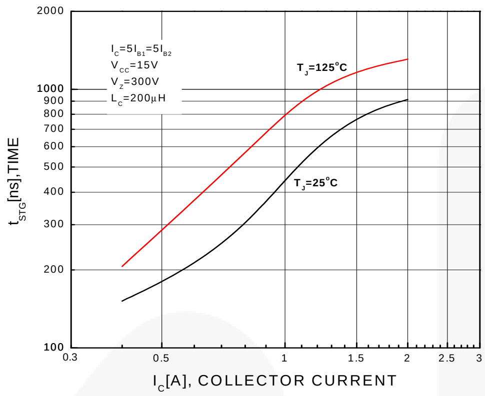


Figure 19. Inductive Switching Time, t_c

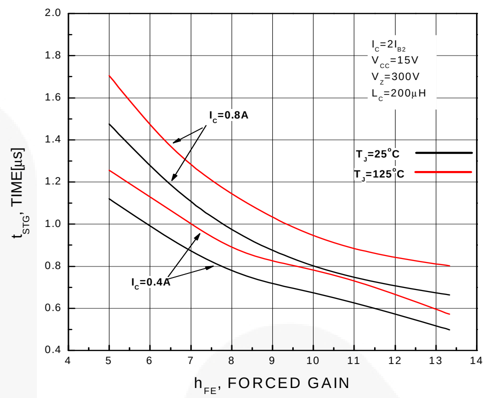


Figure 20. Inductive Switching Time, t_{STG}

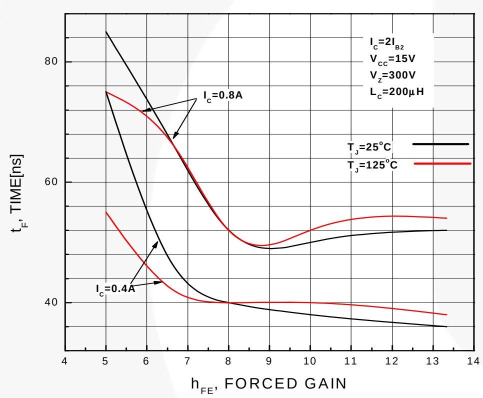


Figure 21. Inductive Switching Time, t_F

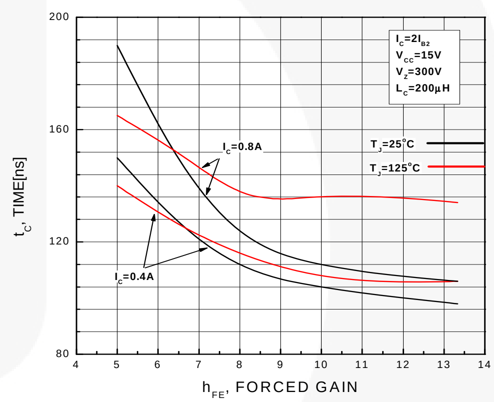


Figure 22. Inductive Switching Time, t_c

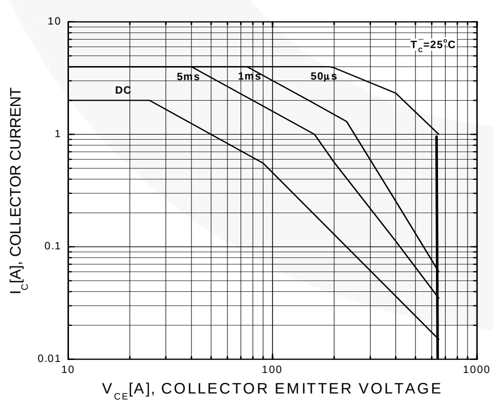


Figure 23. Forward Bias Safe Operating Area

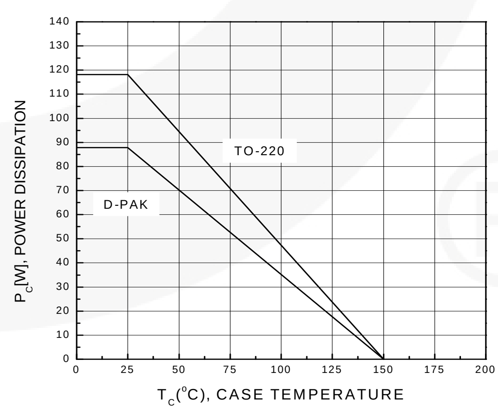


Figure 24. Power Derating

KSC5502D / KSC5502DT — NPN Triple Diffused Planar Silicon Transistor

Typical Performance Characteristics (Continued)

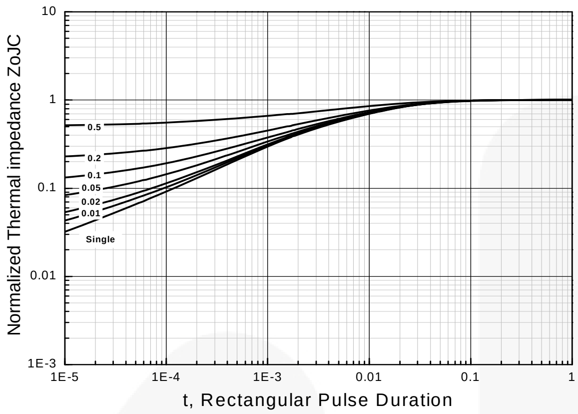


Figure 25. ZoJC, Transient Thermal Impedance (D-PAK)

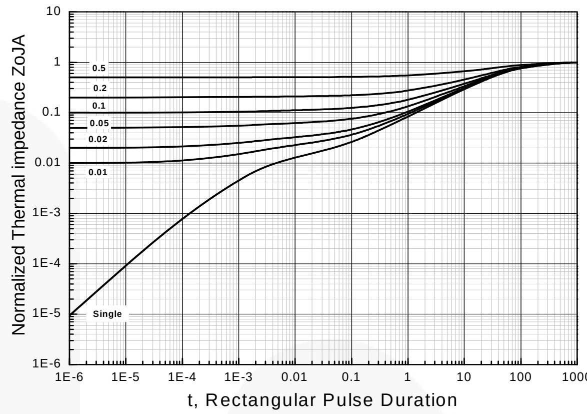


Figure 26. ZoJA, Transient Thermal Impedance (D-PAK)

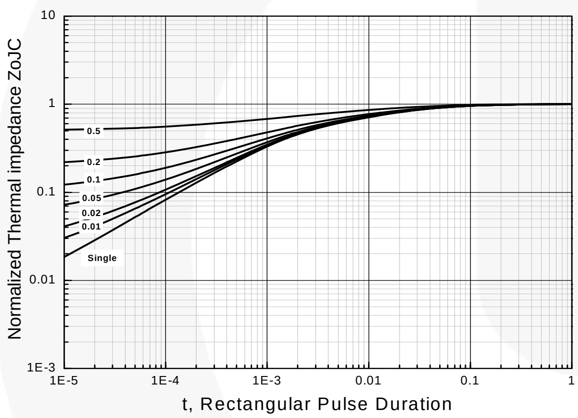


Figure 27. ZoJC, Transient Thermal Impedance (TO-220)

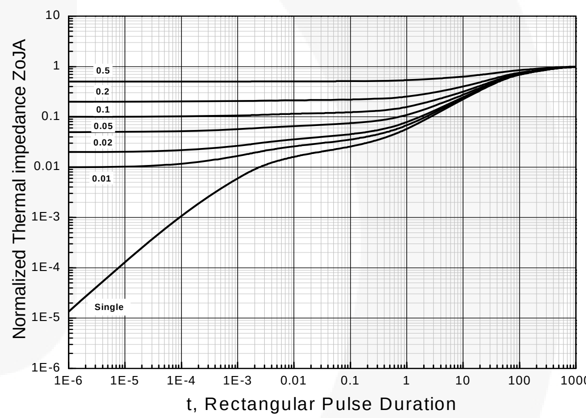


Figure 28. ZoJA, Transient Thermal Impedance (TO-220)

Physical Dimensions

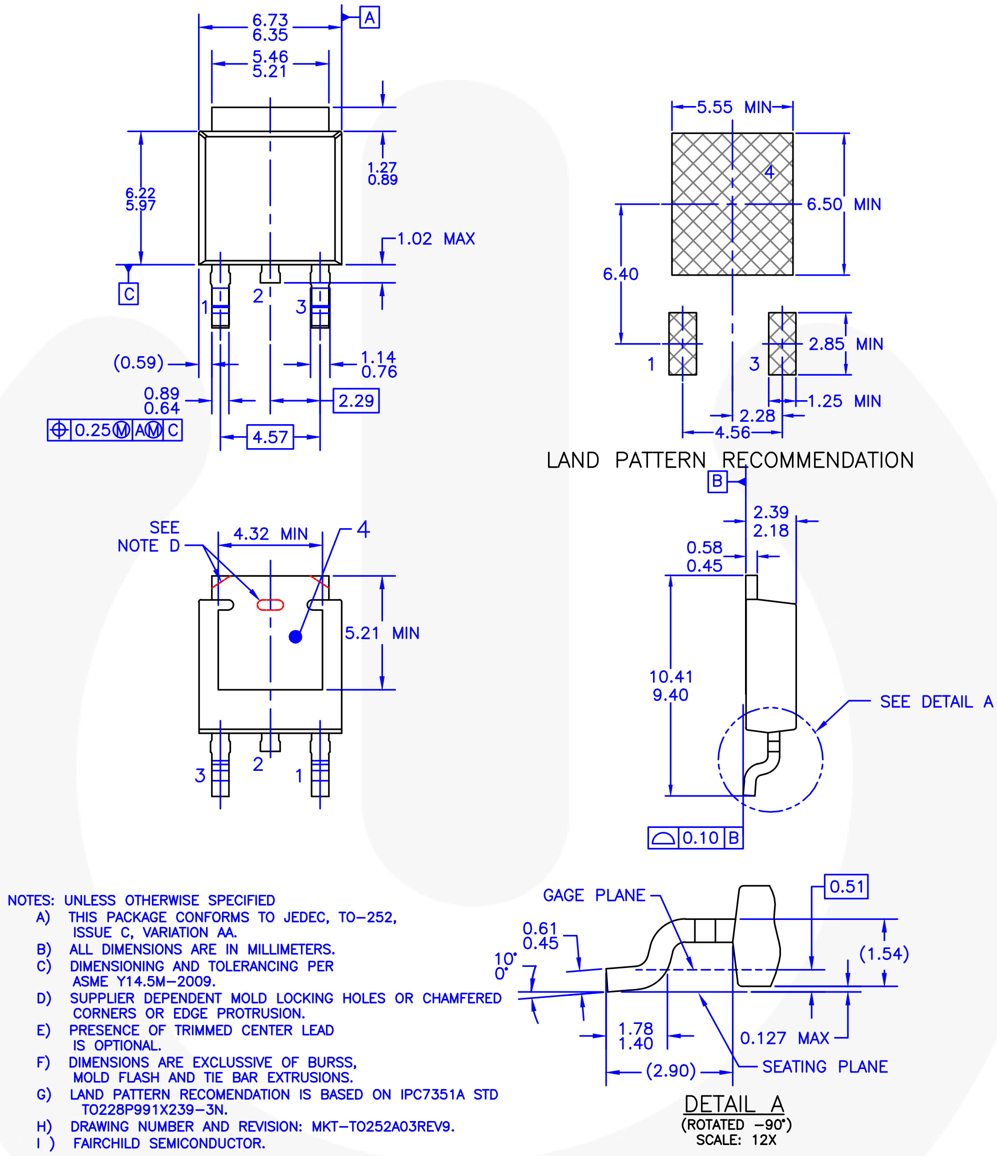


Figure 29. TO-252 (D-PAK), MOLDED, 3-LEAD, OPTION AA & AB

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Physical Dimensions

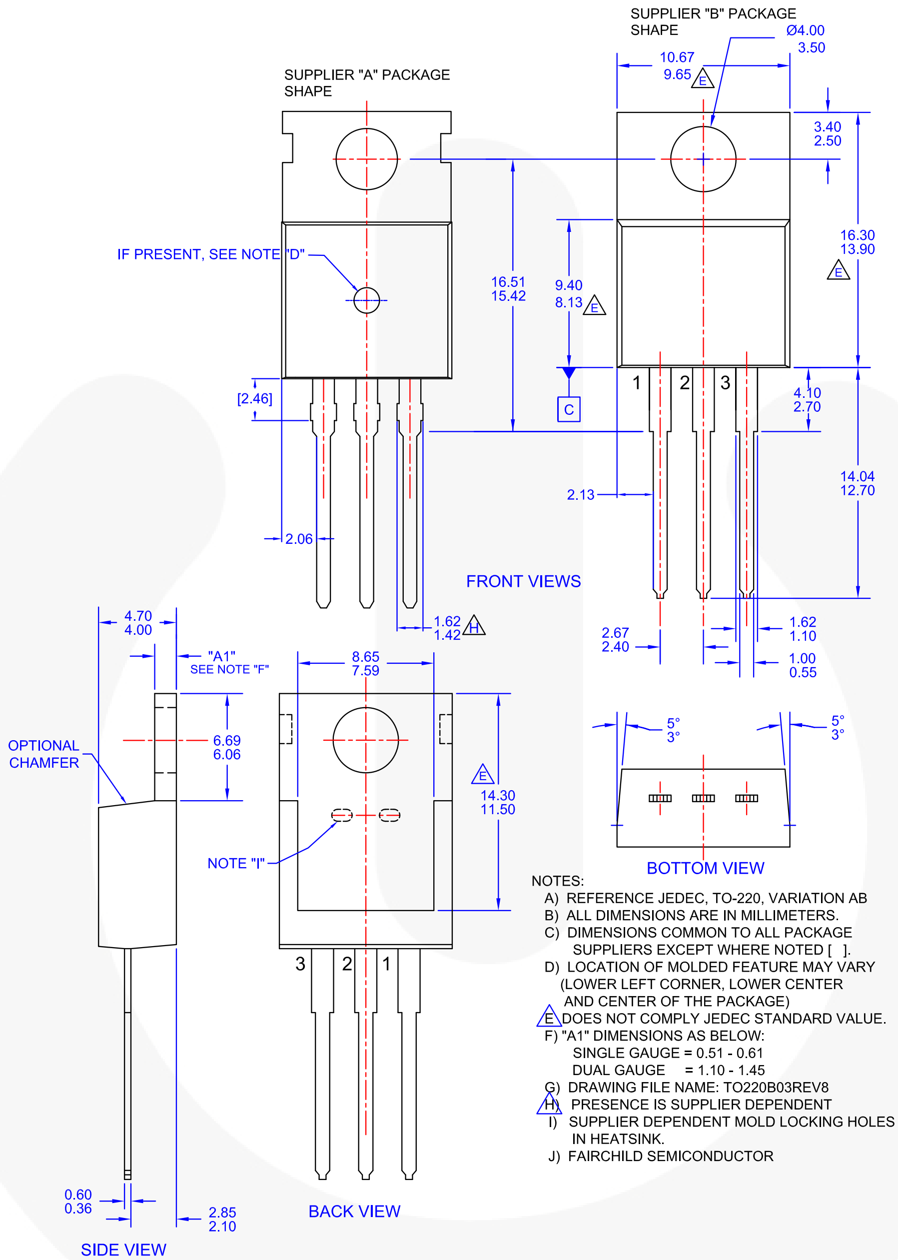

Figure 30. TO-220, MOLDED, 3LEAD, JEDEC VARIATION AB

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SuperSOT™-8
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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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