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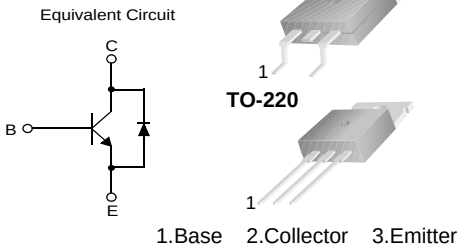
FAIRCHILD SEMICONDUCTOR®

December 2009

KSC5402D/KSC5402DT
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
- Two Package Choices; D-PAK or TO-220



1.Base 2.Collector 3.Emitter

Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CBO}	Collector-Base Voltage	1000	V
V_{CEO}	Collector-Emitter Voltage	450	V
V_{EBO}	Emitter-Base Voltage	12	V
I_C	Collector Current (DC)	2	A
I_{CP}	*Collector Current (Pulse)	5	A
I_B	Base Current (DC)	1	A
I_{BP}	*Base Current (Pulse)	2	A
P_C	Power Dissipation(T_C=25°C) : D-PAK* : TO-220	30 50	W W
T_J	Junction Temperature	150	°C
T_{STG}	Storage Temperature	- 65 to 150	°C

* Pulse Test: Pulse Width=5ms, Duty Cycle≤10%

Thermal Characteristics T_A=25°C unless otherwise noted

Symbol	Parameter		Rating		Units
			TO-220	D-PAK	
$R_{\theta JC}$	Thermal Resistance	Junction to Case	2.5	4.17*	°C/W
$R_{\theta JA}$		Junction to Ambient	62.5	50	°C/W
T_L	Maximum Lead Temperature for Soldering Purpose ; 1/8" from Case for 5 Seconds		270	270	°C

* Mounted on 1" square PCB (FR4 ro G-10 Material)

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Electrical Characteristics T_A=25°C unless otherwise noted

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Units
BV_{CBO}	Collector-Base Breakdown Voltage	I_C=1mA, I_E=0		1000	1090		V
BV_{CEO}	Collector-Emitter Breakdown Voltage	I_C=5mA, I_B=0		450	525		V
BV_{EBO}	Emitter-Base Breakdown Voltage	I_E=1mA, I_C=0		12	14		V
I_{CES}	Collector Cut-off Current	V_{CES}=1000V, I_{EB}=0	T_A=25°C		0.03	100	μA
			T_A=125°C		1.2	500	μA
I_{CEO}	Collector Cut-off Current	V_{CE}=450V, V_B=0	T_A=25°C		0.3	100	μA
			T_A=125°C		15	500	μA
I_{EBO}	Emitter Cut-off Current	V_{EB}=10V, I_C=0			0.01	100	μA
h_{FE}	DC Current Gain	V_{CE}=1V, I_C=0.4A	T_A=25°C	14	29		
			T_A=125°C	8	17		
		V_{CE}=1V, I_C=1A	T_A=25°C	6	9		
			T_A=125°C	4	6		
V_{CE}(sat)	Collector-Emitter Saturation Voltage	I_C=0.4, I_B=0.04A	T_A=25°C		0.25	0.6	V
			T_A=125°C		0.4	1.0	V
		I_C=1A, I_B=0.2A	T_A=25°C		0.3	0.75	V
			T_A=125°C		0.65	1.2	V
V_{BE}(sat)	Base-Emitter Saturation Voltage	I_C=0.4A, I_B=0.04A	T_A=25°C		0.78	1.0	V
			T_A=125°C		0.65	0.9	V
		I_C=1A, I_B=0.2A	T_A=25°C		0.85	1.1	V
			T_A=125°C		0.75	1.0	V
C_{ib}	Input Capacitance	V_{EB}=8V, I_C=0, f=1MHz			330	500	pF
C_{ob}	Output Capacitance	V_{CB}=10V, I_E=0, f=1MHz			35	100	pF
f_T	Current Gain Bandwidth Product	I_C=0.5A, V_{CE}=10V			11		MHz
V_F	Diode Forward Voltage	I_F=1A	T_A=25°C		0.86	1.5	V
		I_F=0.2A	T_A=25°C		0.75	1.2	V
			T_A=125°C		0.6		V
		I_F=0.4A	T_A=25°C		0.8	1.3	V
			T_A=125°C		0.65		V

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Electrical Characteristics (Continued) T_A=25°C unless otherwise noted

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Units
t_{fr}	Diode Froward Recvery Time (di/dt=10A/μs)	I_F=0.2A I_F=0.4A I_F=1A			540 520 480		ns ns ns
V_{CE}(DSAT)	Dynamic Saturation Voltage	I_C=0.4A, I_{B1}=40mA V_{CC}=300V	@ 1μs		7.5		V
			@ 3μs		2.5		V
		I_C=1A, I_{B1}=200mA V_{CC}=300	@ 1μs		11.5		V
			@ 3μs		1.5		V
RESISTIVE LOAD SWITCHING (D.C ≤ 10%, Pulse Width=20μs)							
t_{ON}	Turn On Time	I_C=1A, I_{B1}=200mA, I_{B2}=150mA, V_{CC}=300V, R_L = 300Ω	T_A=25°C		110	150	ns
			T_A=125°C		135		ns
t_{OFF}	Turn Off Time		T_A=25°C	0.95		1.25	μs
			T_A=125°C		1.4		μs
INDUCTIVE LOAD SWITCHING (V_{CC}=15V)							
t_{STG}	Storage Time	I_C=0.4A, I_{B1}=40mA, I_{B2}=200mA, Vz=300V, L_C=200H	T_A=25°C		0.56	0.65	μs
			T_A=125°C		0.7		μs
t_F	Fall Time		T_A=25°C		60	175	ns
			T_A=125°C		75		ns
t_C	Cross-over Time		T_A=25°C		90	175	ns
			T_A=125°C		90		ns
t_{STG}	Storage Time	I_C=0.8A, I_{B1}=160mA, I_{B2}=160mA, Vz=300V, L_C=200H	T_A=25°C			2.75	μs
			T_A=125°C		3		μs
t_F	Fall Time		T_A=25°C		110	175	ns
			T_A=125°C		180		ns
t_C	Cross-over Time		T_A=25°C		125	350	ns
			T_A=125°C		185		ns
t_{STG}	Storage Time	I_C=1A, I_{B1}=200mA, I_{B2}=500mA, V_Z=300V, L_C=200μH	T_A=25°C		1.1	1.2	μs
			T_A=125°C		1.35		μs
t_F	Fall Time		T_A=25°C		105	150	ns
			T_A=125°C		75		ns
t_C	Cross-over Time		T_A=25°C		125	150	ns
			T_A=125°C		100		ns

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Typical Performance Characteristics

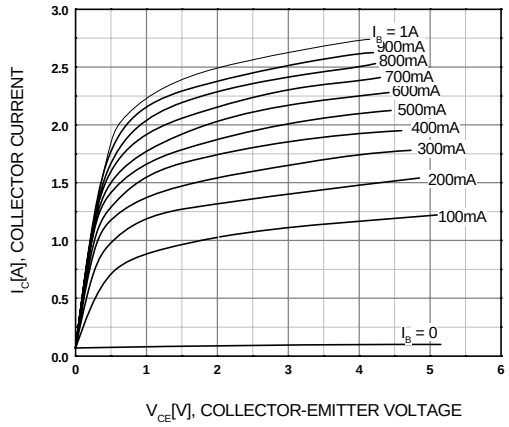


Figure 1. Static Characteristic

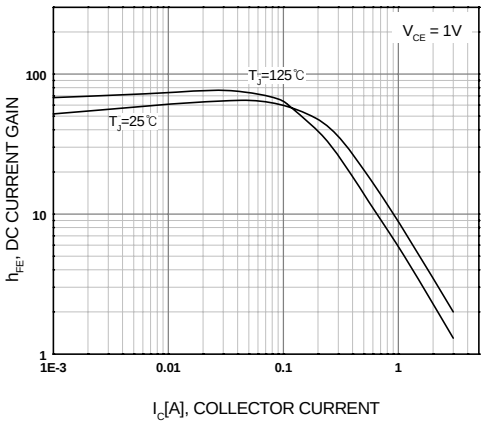


Figure 2. DC current Gain

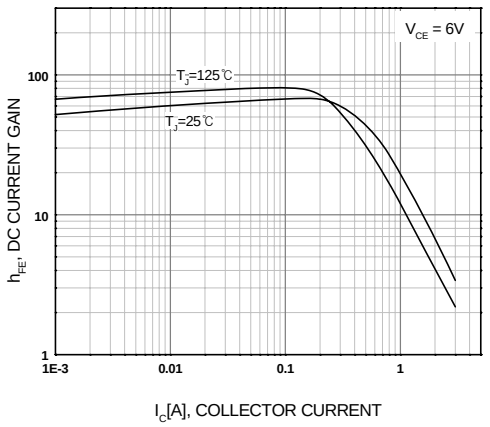


Figure 3. DC current Gain

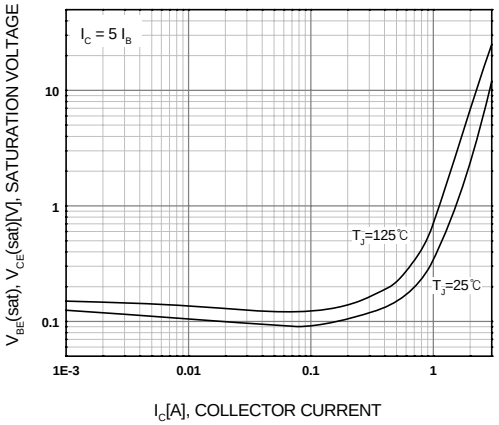


Figure 4. Collector-Emitter Saturation Voltage

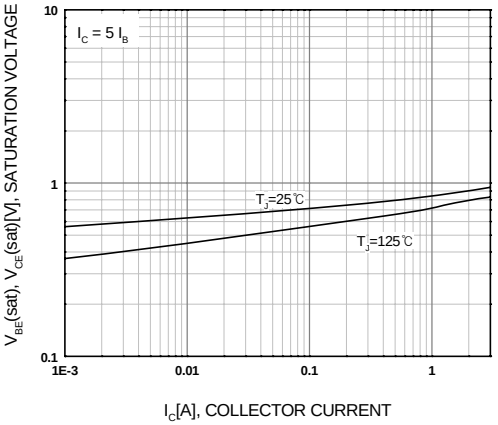


Figure 5. Base-Emitter Saturation Voltage

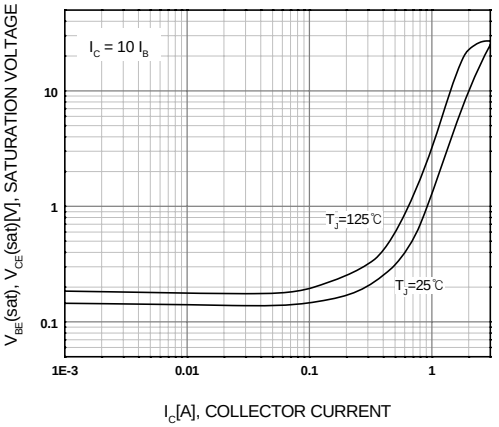


Figure 6. Collector-Emitter Saturation Voltage

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Typical Performance Characteristics (Continued)

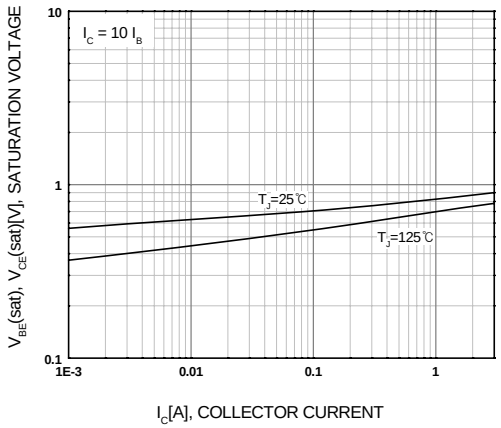


Figure 7. Base-Emitter Saturation Voltage

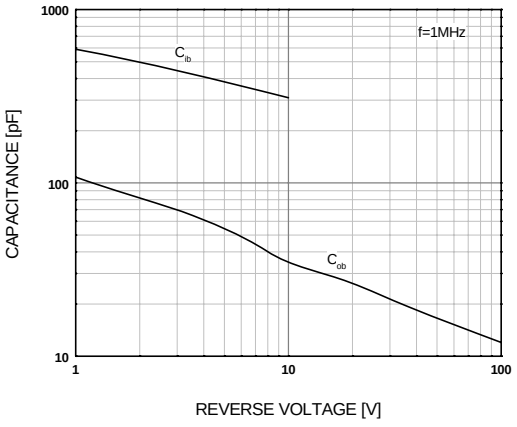


Figure 8. Collector Output Capacitance

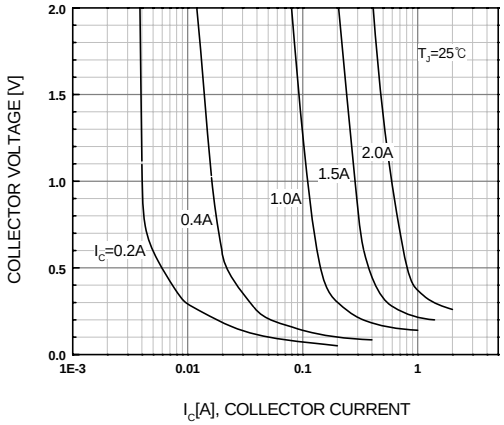


Figure 9. Typical Collector Saturation Region

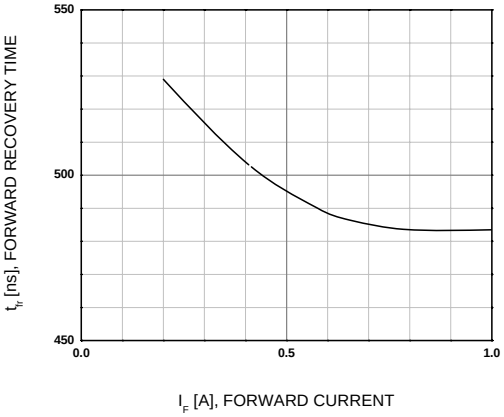


Figure 10. Forward Recovery Time

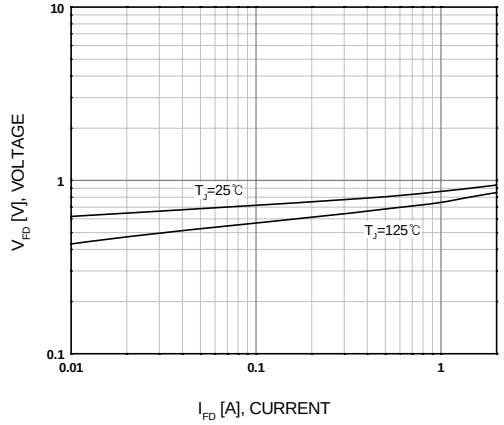


Figure 11. Diode Forward Voltage

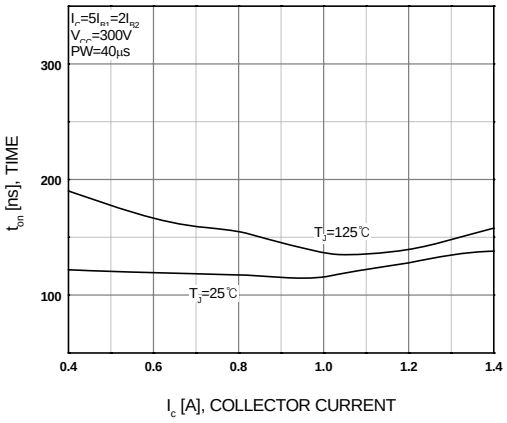


Figure 12. Resistive Switching Time, t_{on}

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Typical Performance Characteristics (Continued)

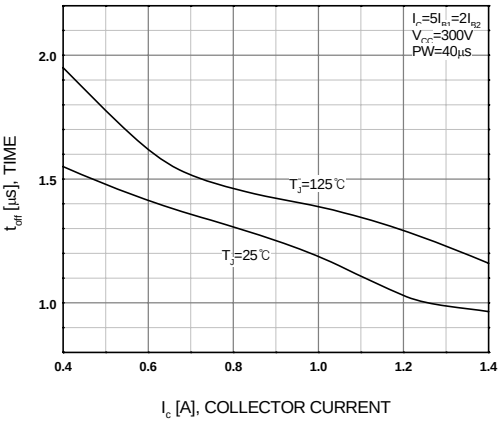


Figure 13. Resistive Switching Time, t_{off}

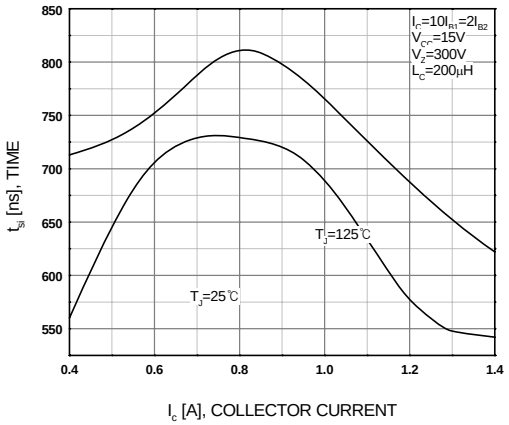


Figure 14. Inductive Switching Time, t_{si}

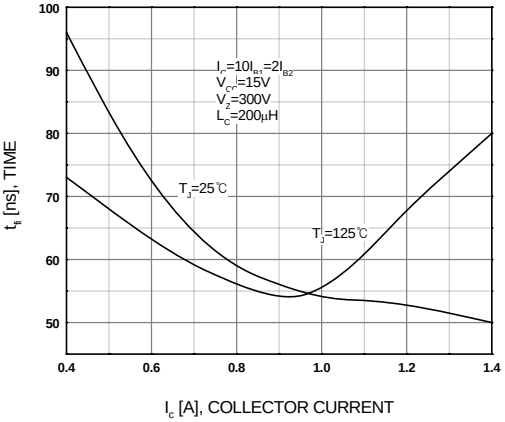


Figure 15. Inductive Switching Time, t_{fi}

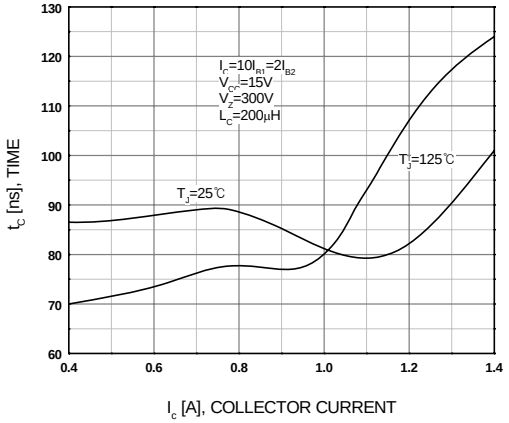


Figure 16. Inductive Switching Time, t_c

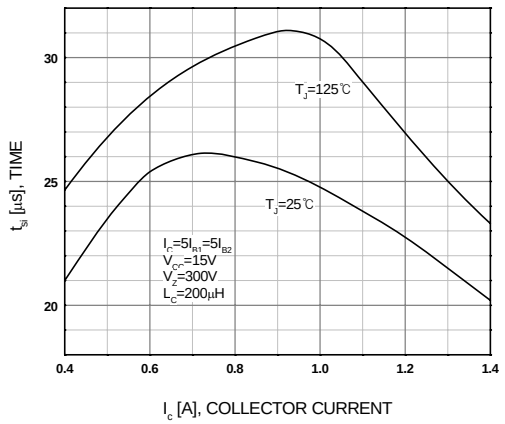


Figure 17. Inductive Switching Time, t_{si}

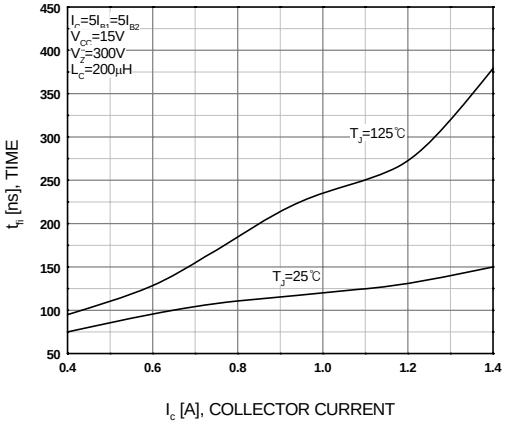


Figure 18. Inductive Switching Time, t_{fi}

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Typical Performance Characteristics (Continued)

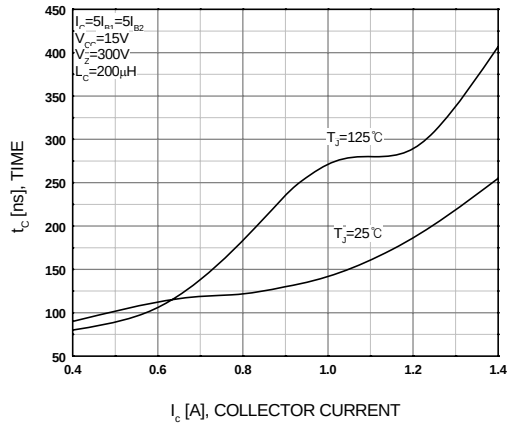


Figure 19. Inductive Switching Time, t_c

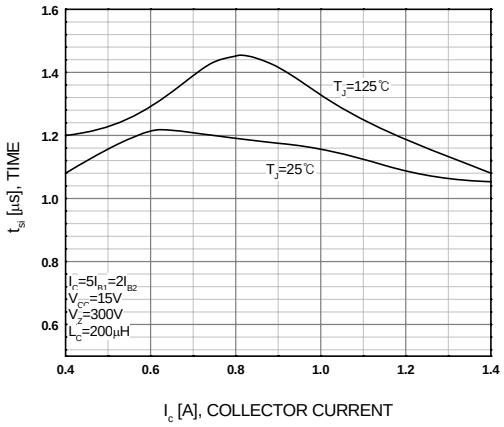


Figure 20. Inductive Switching Time, t_{si}

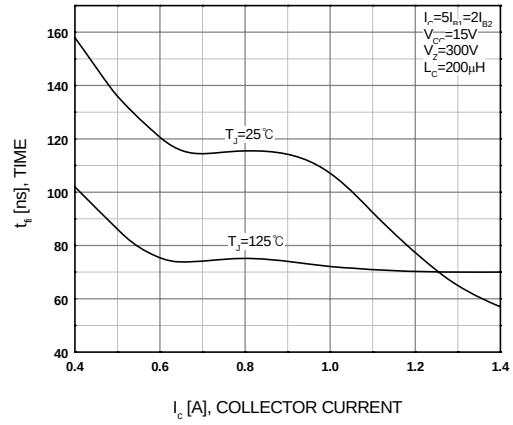


Figure 21. Inductive Switching Time, t_{fi}

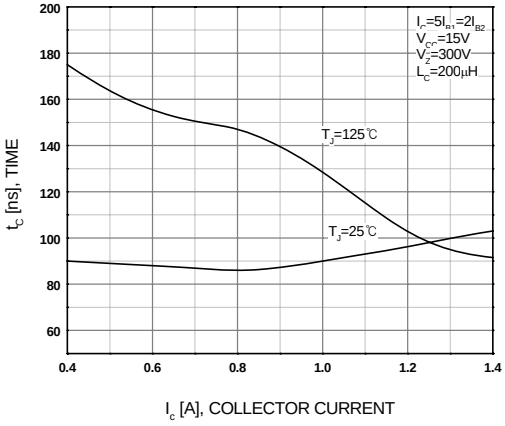


Figure 22. Inductive Switching Time, t_c

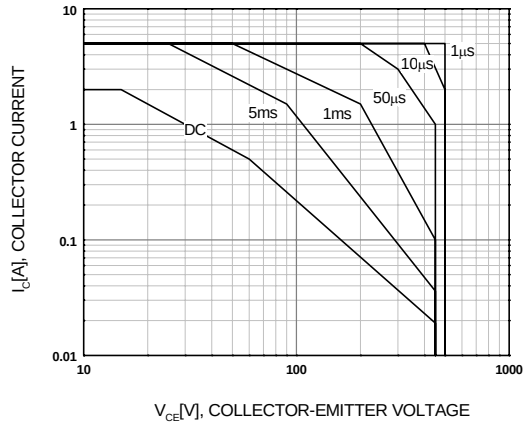


Figure 23. Forward Bias Safe Operating Area

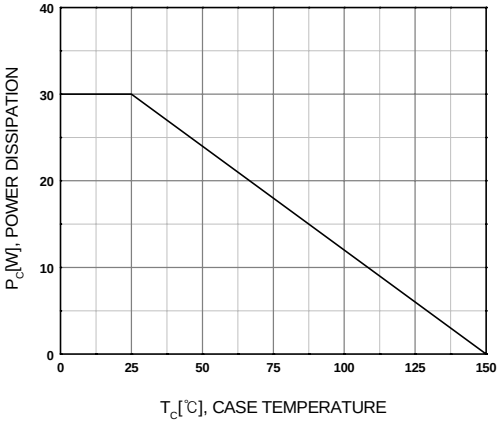
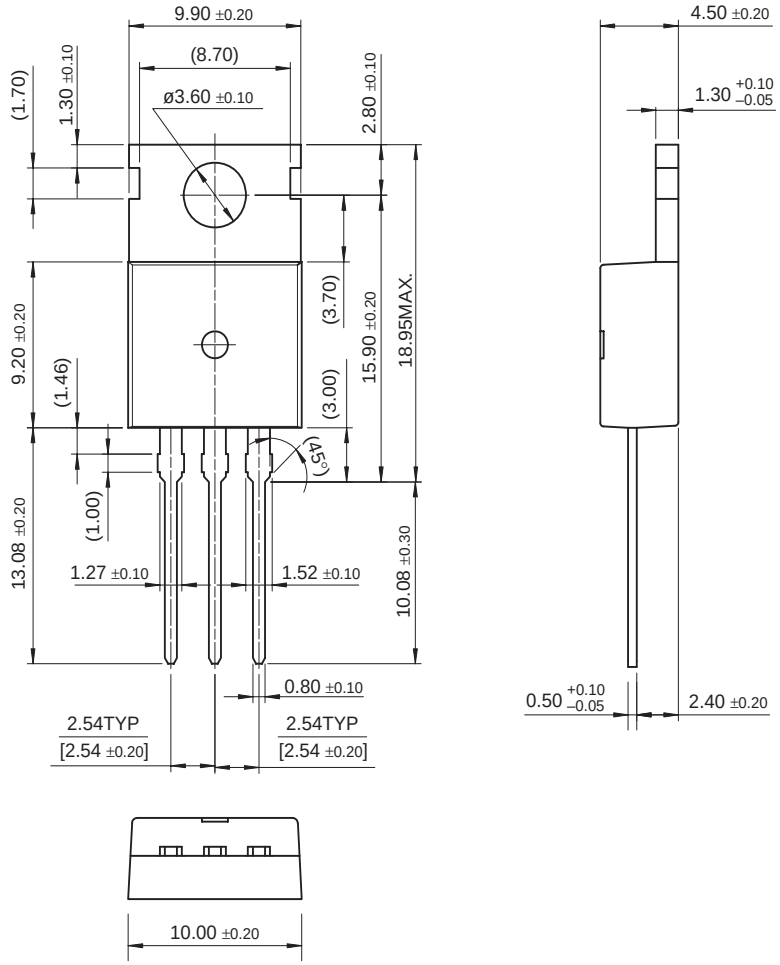


Figure 24. Power Derating

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Physical Dimension

TO-220

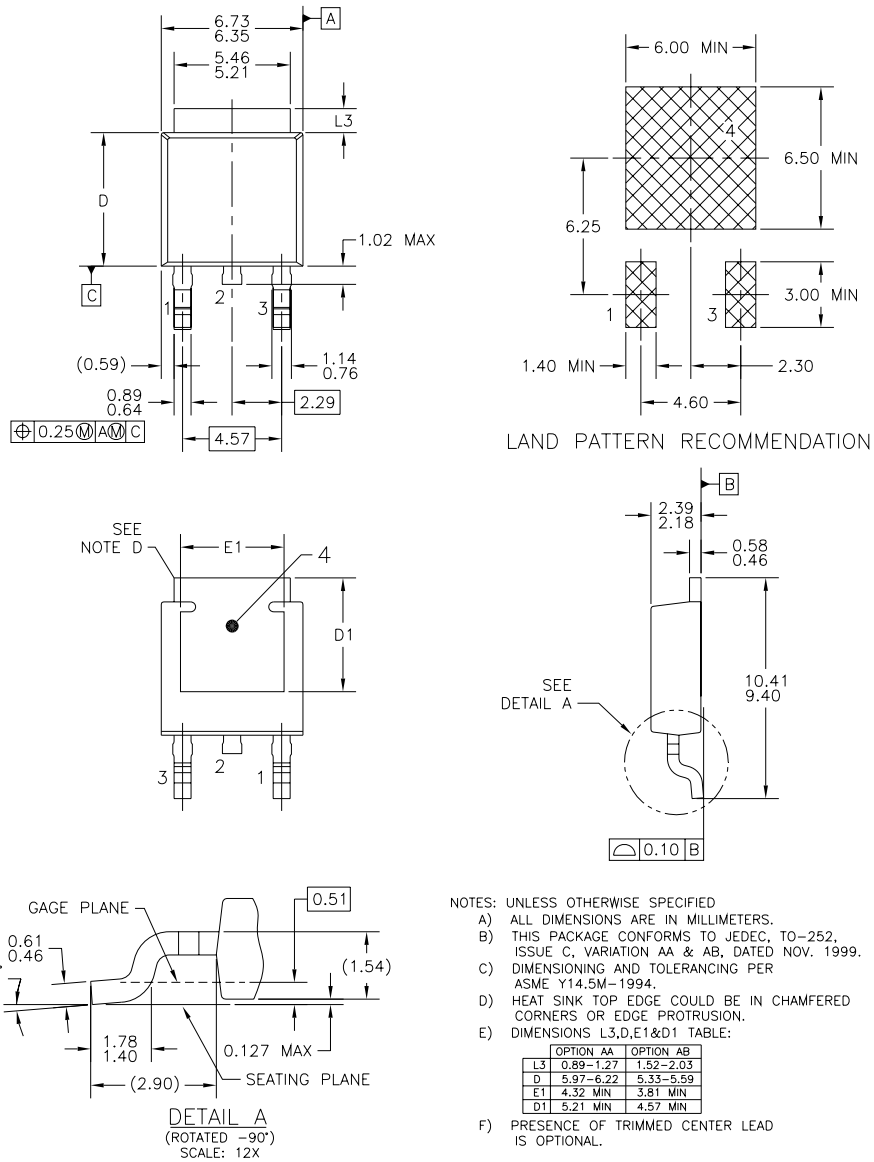


Dimensions in Millimeters

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Physical Dimension (Continued)

D-PAK



NOTES: UNLESS OTHERWISE SPECIFIED

A) ALL DIMENSIONS ARE IN MILLIMETERS.

B) THIS PACKAGE CONFORMS TO JEDEC, TO−252, ISSUE C, VARIATION AA & AB, DATED NOV. 1999.

C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M−1994.

D) HEAT SINK TOP EDGE COULD BE IN CHAMFERED CORNERS OR EDGE PROTRUSION.

E) DIMENSIONS L3,D,E1&D1 TABLE:

	OPTION AA	OPTION AB
L3	0.89−1.27	1.52−2.03
D	5.97−6.22	5.33−5.59
E1	4.32 MIN	3.81 MIN
D1	5.21 MIN	4.57 MIN

F) PRESENCE OF TRIMMED CENTER LEAD IS OPTIONAL.

Dimensions in Millimeters

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Green FPS™ e-Series™
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Definition of Terms

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