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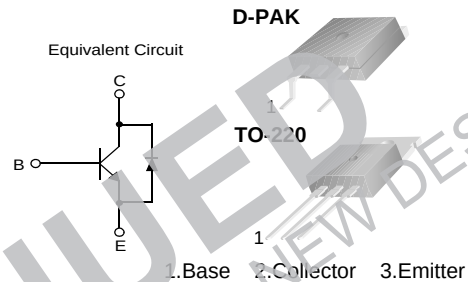
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KSC5402D/KSC5402DT

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



Absolute Maximum Ratings $T_A=25^\circ\text{C}$ 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 ($T_C=25^\circ\text{C}$) : D-PAK*	30	W
	: TO-220	50	W
T_J	Junction Temperature	150	$^\circ\text{C}$
T_{STG}	Storage Temperature	- 65 to 150	$^\circ\text{C}$

* Pulse Test: Pulse Width=5ms, Duty Cycle $\leq$ 10%

Thermal Characteristics $T_A=25^\circ\text{C}$ unless otherwise noted

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

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

Electrical Characteristics $T_A=25^\circ\text{C}$ unless otherwise noted

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

Electrical Characteristics (Continued) $T_A=25^\circ\text{C}$ 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, V _Z =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		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

Typical Performance Characteristics

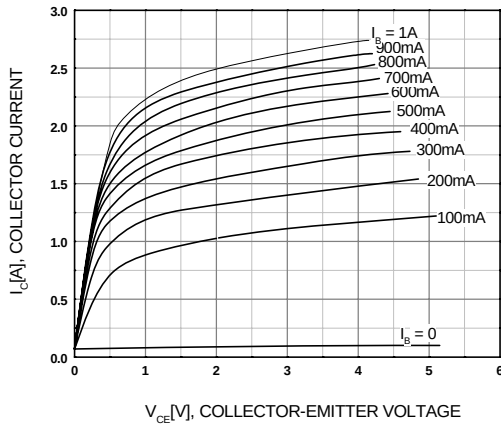


Figure 1. Static Characteristic

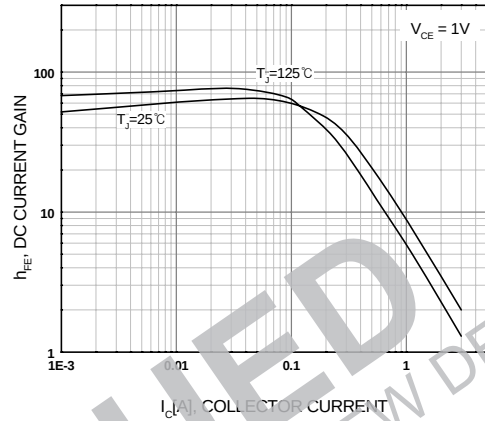


Figure 2. DC current Gain

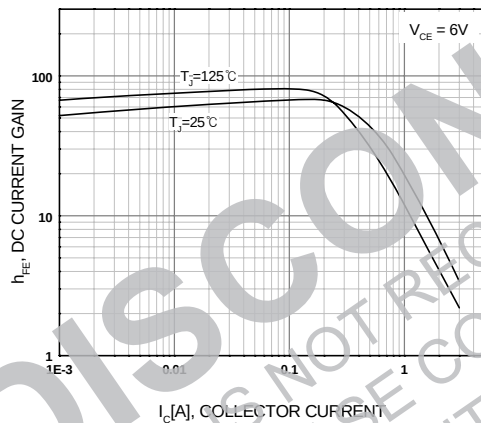


Figure 3. DC current Gain

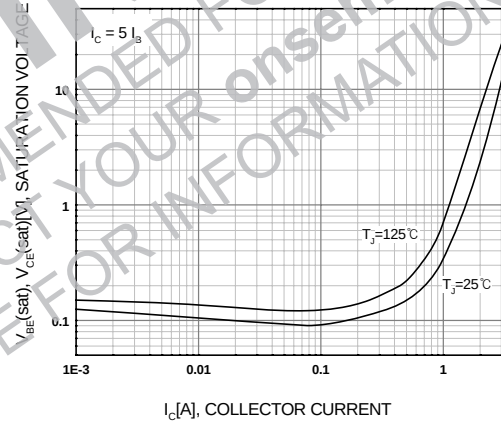


Figure 4. Collector-Emitter Saturation Voltage

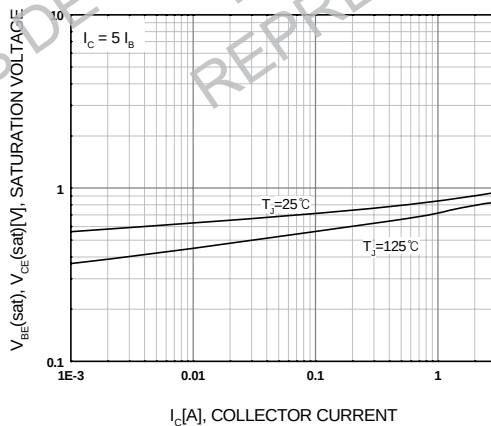


Figure 5. Base-Emitter Saturation Voltage

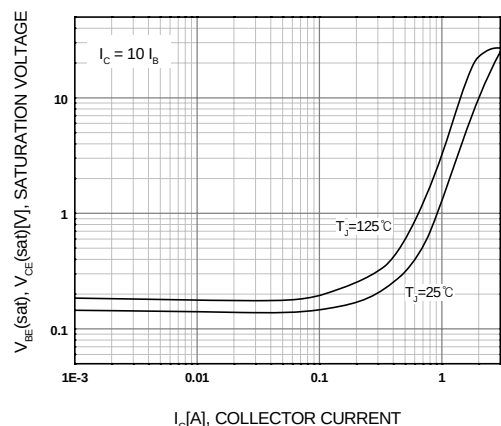


Figure 6. Collector-Emitter Saturation Voltage

Typical Performance Characteristics (Continued)

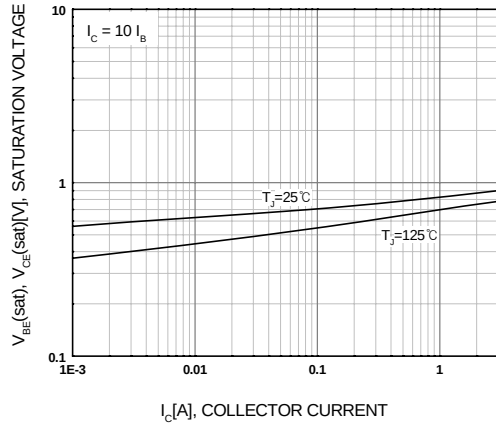


Figure 7. Base-Emitter Saturation Voltage

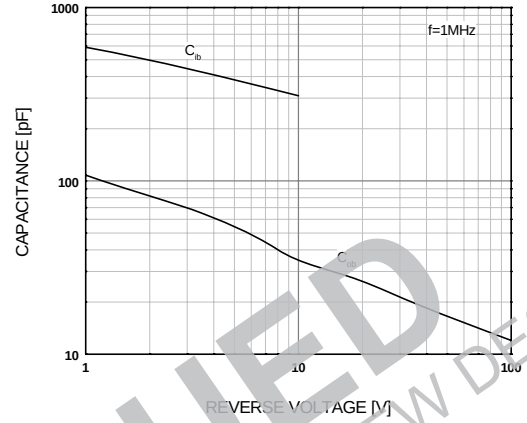


Figure 8. Collector Output Capacitance

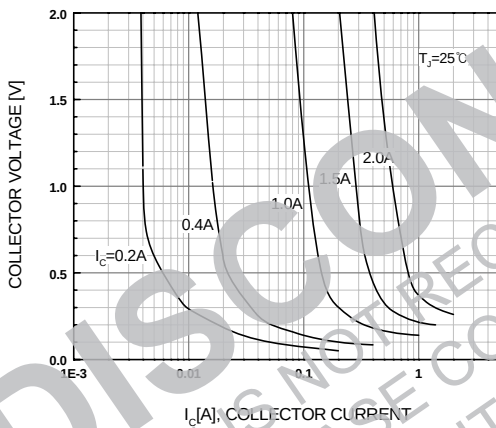


Figure 9. Typical Collector Saturation Region

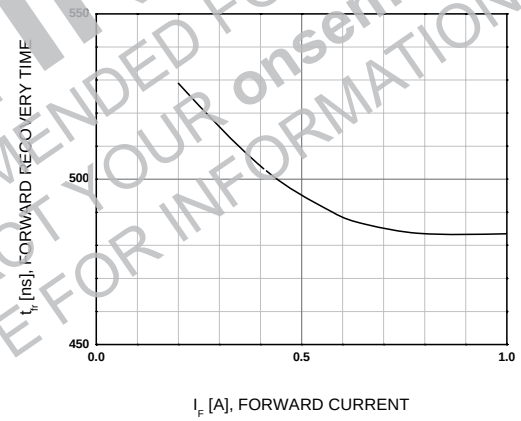


Figure 10. Forward Recovery Time

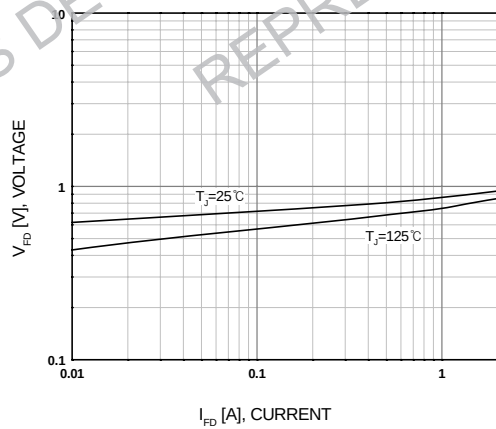


Figure 11. Diode Forward Voltage

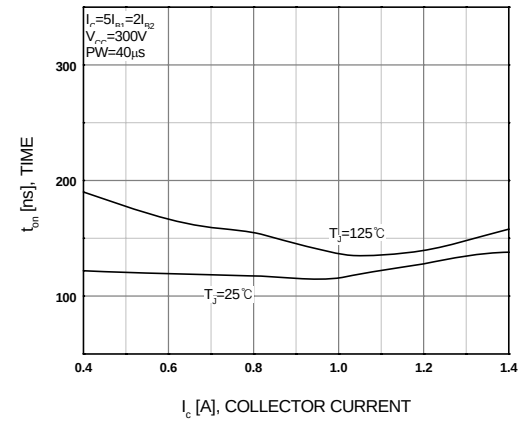
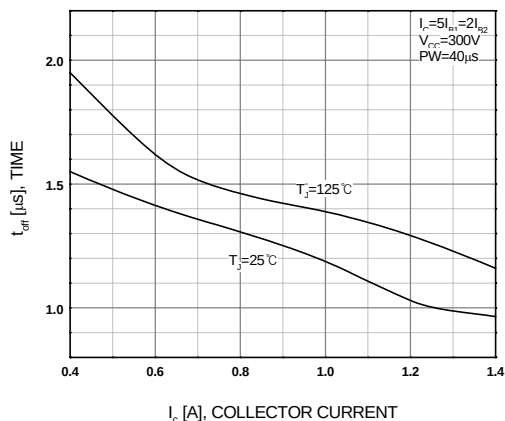
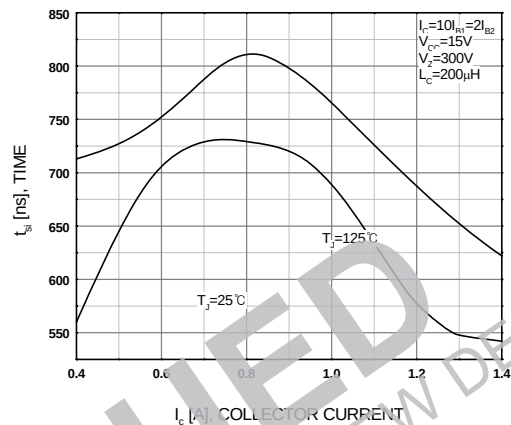
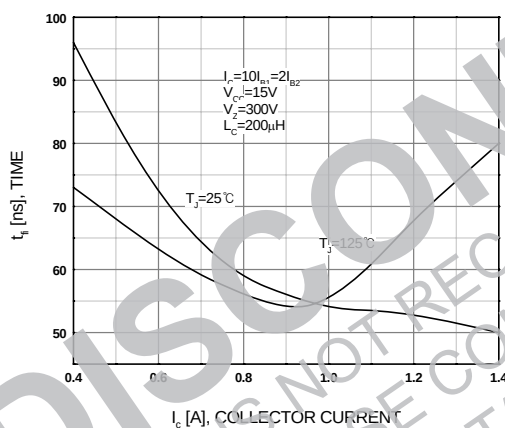
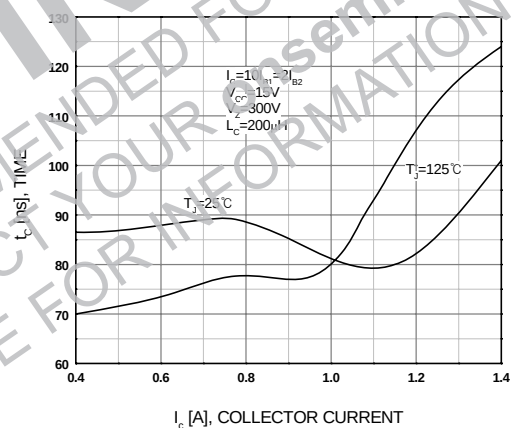
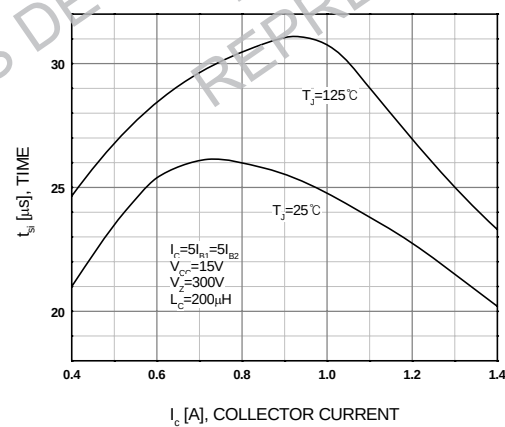
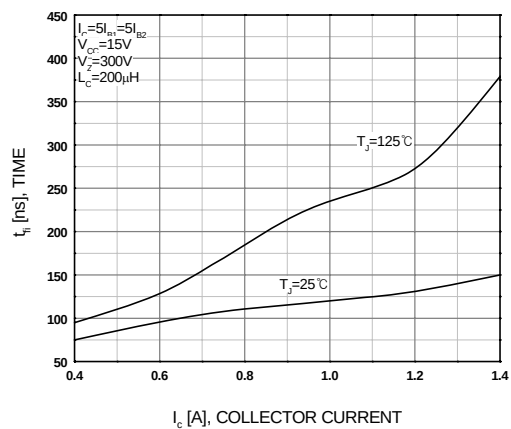


Figure 12. Resistive Switching Time, t_{on}

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}

Typical Performance Characteristics (Continued)

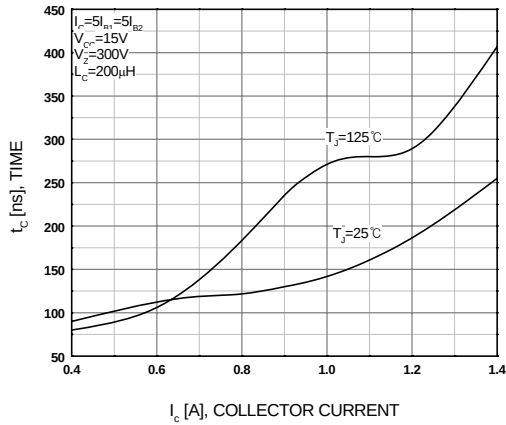


Figure 19. Inductive Switching Time, t_c

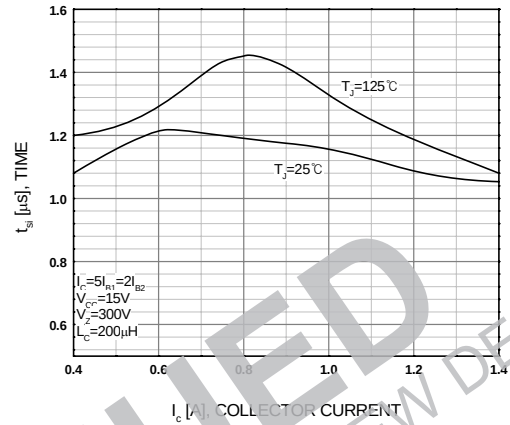


Figure 20. Inductive Switching Time, t_{si}

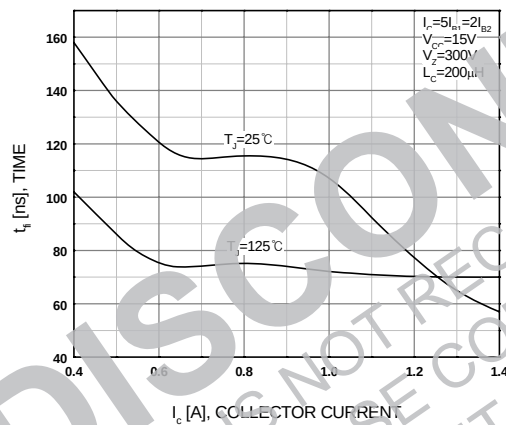


Figure 21. Inductive Switching Time, t_{fi}

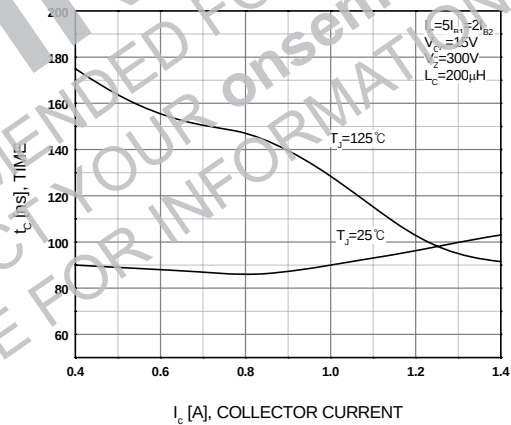


Figure 22. Inductive Switching Time, t_c

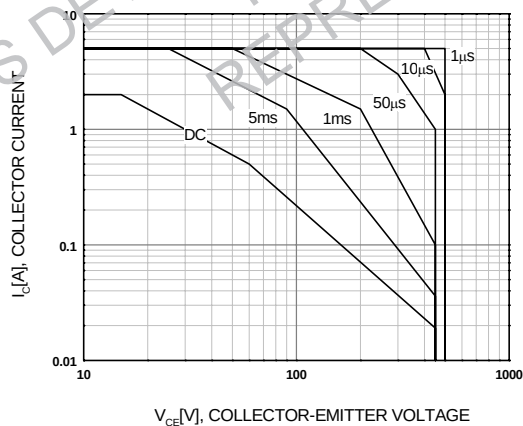


Figure 23. Forward Bias Safe Operating Area

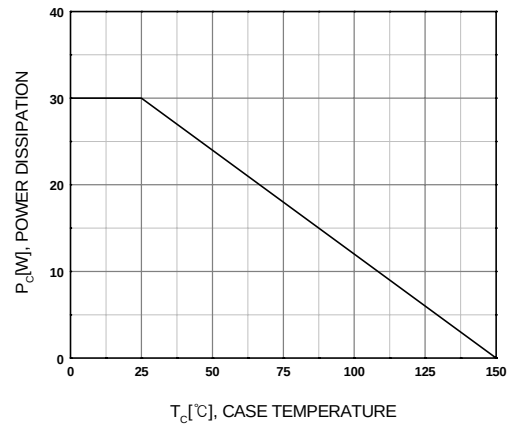
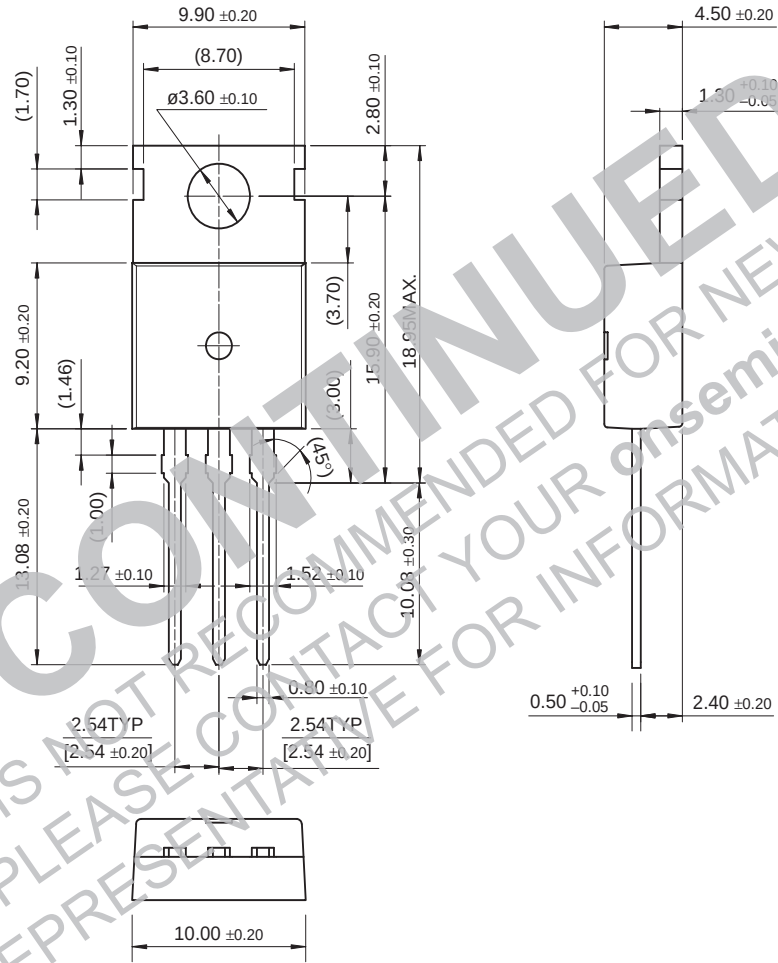


Figure 24. Power Derating

Physical Dimension

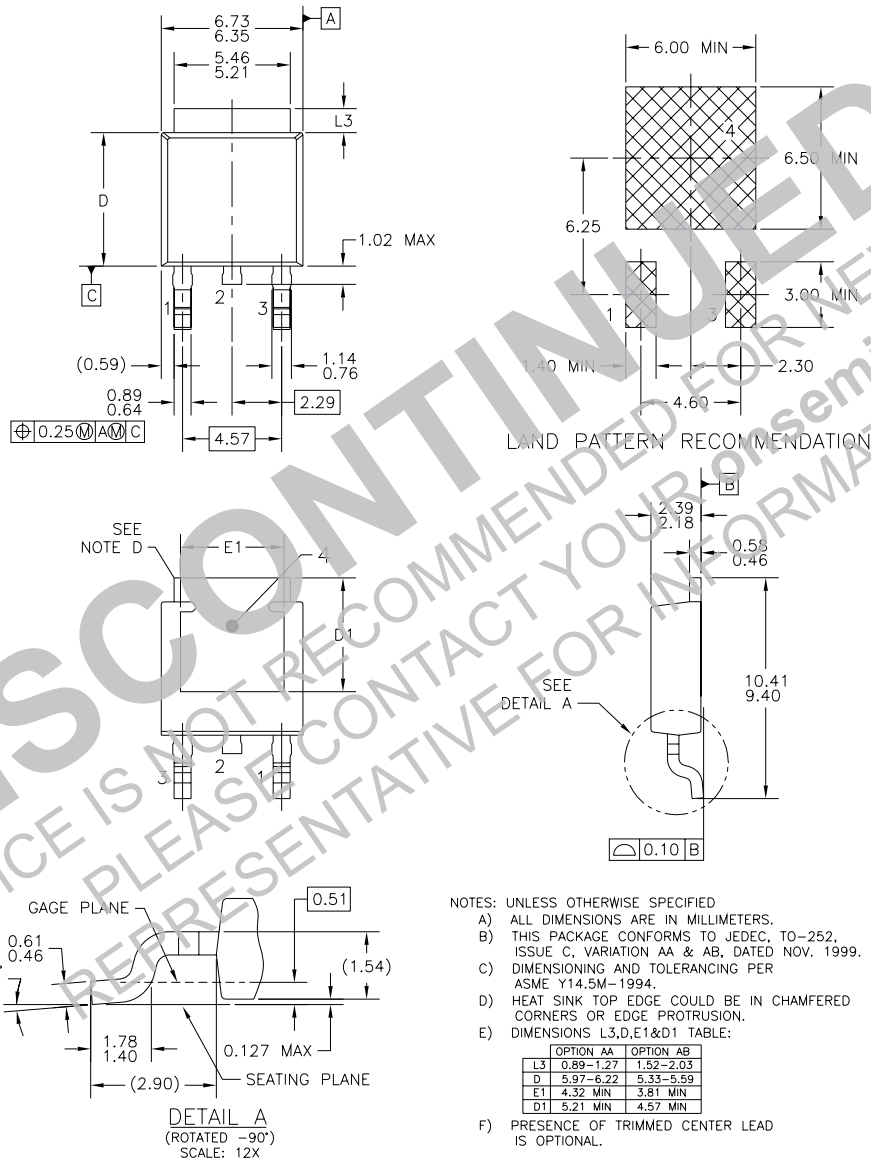
TO-220



Dimensions in Millimeters

Physical Dimension (Continued)

D-PAK



Dimensions in Millimeters



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Rev. I41

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