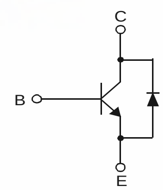
FAIRCHILD SEMICONDUCTOR®

KSC5402D/KSC5402DT

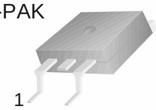
High Voltage High Speed Power Switch Application

- 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

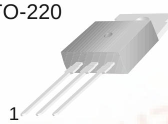
Equivalent Circuit



D-PAK



TO-220



1.Base 2.Collector 3.Emitter

NPN Silicon Transistor Planar Silicon Transistor

Absolute Maximum Ratings T_C=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
T_J	Junction Temperature	150	°C
T_{STG}	Storage Temperature	- 65 ~ 150	°C

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

Thermal Characteristics T_C=25°C unless otherwise noted

Symbol	Characteristics		Rating		Unit
			TO-220	D-PAK	
$R_{θjc}$	Thermal Resistance	Junction to Case	2.5	4.17 *	°C/W
$R_{θja}$		Junction to Ambient	62.5	50	
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)

Electrical Characteristics T_C=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_C=25°C		0.03	100	µA
			T_C=125°C		1.2	500	
I_{CEO}	Collector Cut-off Current	V_{CE}=450V, V_B=0	T_C=25°C		0.3	100	µA
			T_C=125°C		15	500	
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_C=25°C	14	29		
			T_C=125°C	8	17		
		V_{CE}=1V, I_C=1A	T_C=25°C	6	9		
			T_C=125°C	4	6		
V_{CE}(sat)	Collector-Emitter Saturation Voltage	I_C=0.4, I_B=0.04A	T_C=25°C		0.25	0.6	
			T_C=125°C		0.4	1.0	
		I_C=1A, I_B=0.2A	T_C=25°C		0.3	0.75	V
			T_C=125°C		0.65	1.2	V
V_{BE}(sat)	Base-Emitter Saturation Voltage	I_C=0.4A, I_B=0.04A	T_C=25°C		0.78	1.0	V
			T_C=125°C		0.65	0.9	V
		I_C=1A, I_B=0.2A	T_C=25°C		0.85	1.1	V
			T_C=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_C=25°C		0.86	1.5	V
		I_F=0.2A	T_C=25°C		0.75	1.2	V
			T_C=125°C		0.6		V
		I_F=0.4A	T_C=25°C		0.8	1.3	V
			T_C=125°C		0.65		V

Electrical Characteristics T_C=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			540		ns
		I_F=0.4A			520		ns
		I_F=1A			480		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_C=25°C		110	150	ns
			T_C=125°C		135		ns
t_{OFF}	Turn Off Time		T_C=25°C	0.95		1.25	µs
			T_C=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_C=25°C		0.56	0.65	µs
			T_C=125°C		0.7		µs
t_F	Fall Time		T_C=25°C		60	175	ns
			T_C=125°C		75		ns
t_C	Cross-over Time		T_C=25°C		90	175	ns
			T_C=125°C		90		ns
t_{STG}	Storage Time	I_C=0.8A, I_{B1}=160mA I_{B2}=160mA, Vz=300V L_C=200H	T_C=25°C			2.75	µs
			T_C=125°C		3		µs
t_F	Fall Time		T_C=25°C		110	175	ns
			T_C=125°C		180		ns
t_C	Cross-over Time		T_C=25°C		125	350	ns
			T_C=125°C		185		ns
t_{STG}	Storage Time	I_C=1A, I_{B1}=200mA, I_{B2}=500mA, V_Z=300V L_C=200µH	T_C=25°C		1.1	1.2	µs
			T_C=125°C		1.35		µs
t_F	Fall Time		T_C=25°C		105	150	ns
			T_C=125°C		75		ns
t_C	Cross-over Time		T_C=25°C		125	150	ns
			T_C=125°C		100		ns

Typical Characteristics

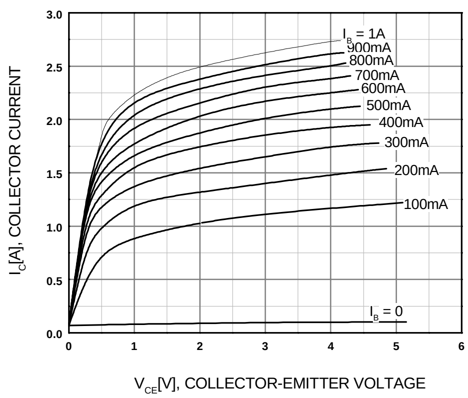


Figure 1. Static Characteristic

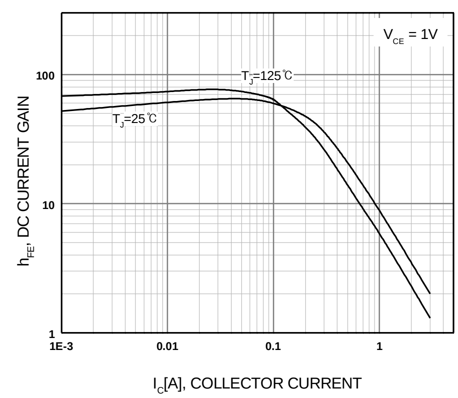


Figure 2. DC current Gain

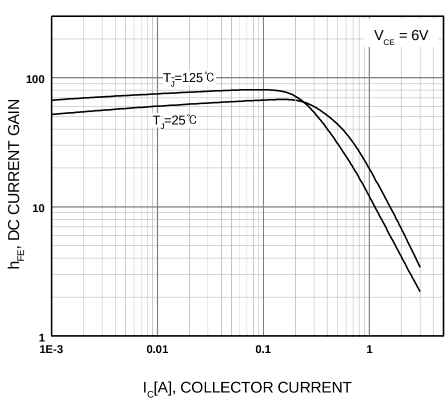


Figure 3. DC current Gain

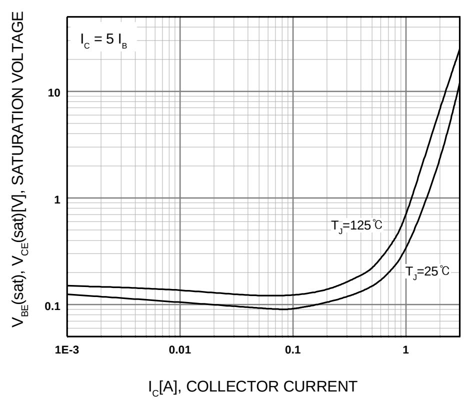


Figure 4. Collector-Emitter Saturation Voltage

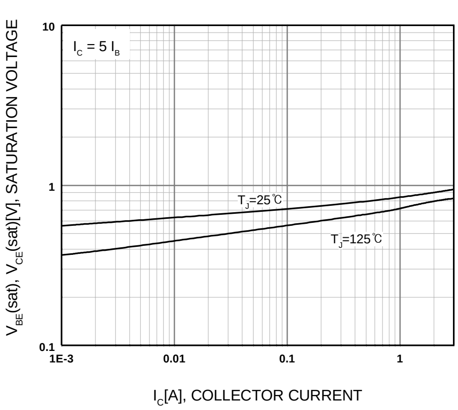


Figure 5. Base-Emitter Saturation Voltage

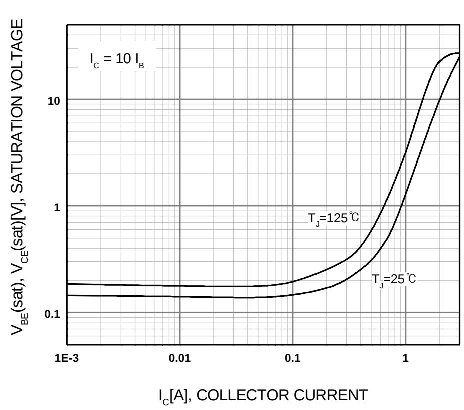


Figure 6. Collector-Emitter Saturation Voltage

Typical Characteristics (Continued)

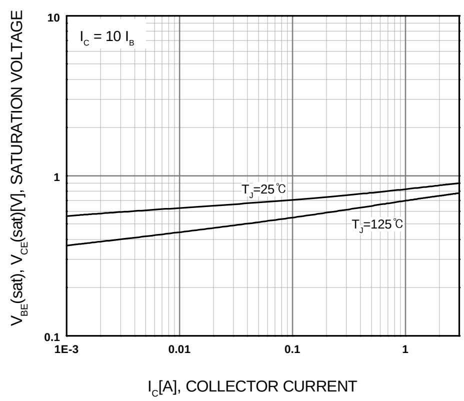


Figure 7. Base-Emitter Saturation Voltage

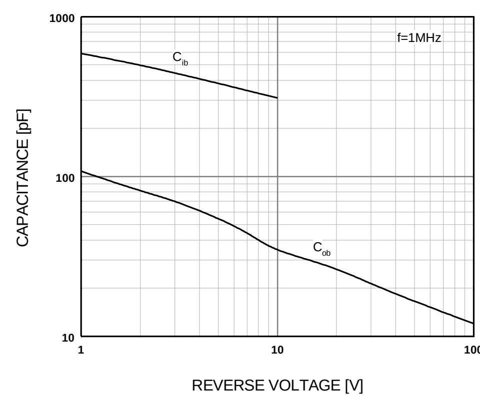


Figure 8. Collector Output Capacitance

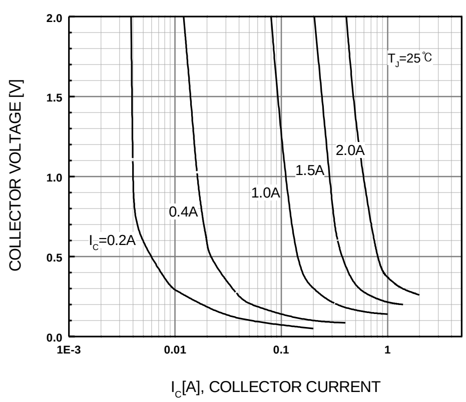


Figure 9. Typical Collector Saturation Region

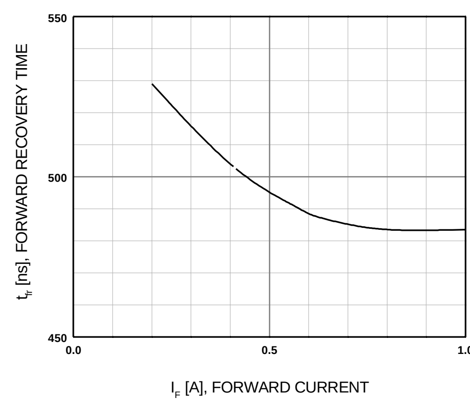


Figure 10. Forward Recovery Time

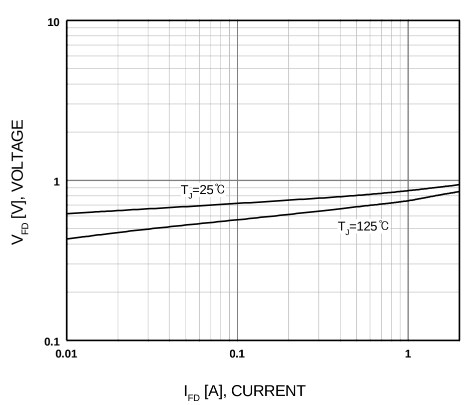


Figure 11. Diode Forward Voltage

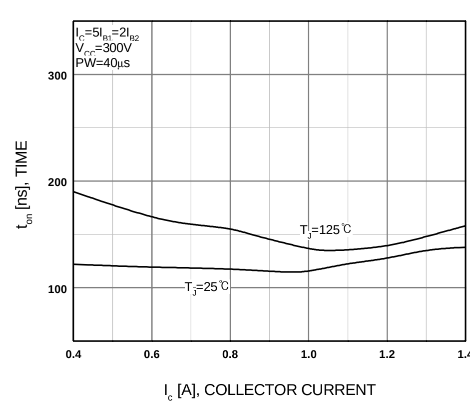


Figure 12. Resistive Switching Time, t_{on}

Typical Characteristics (Continued)

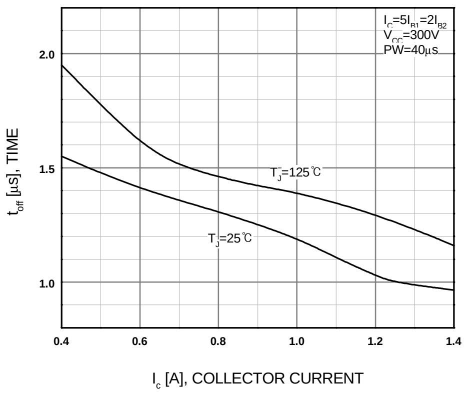


Figure 13. Resistive Switching Time, t_{off}

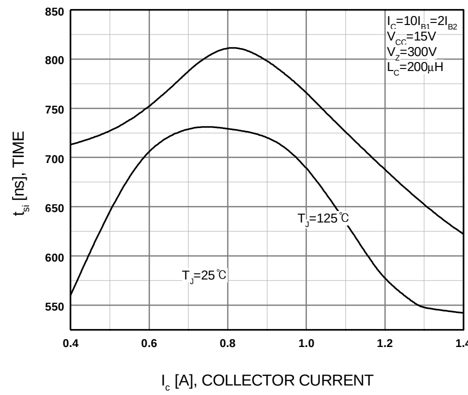


Figure 14. Inductive Switching Time, t_{si}

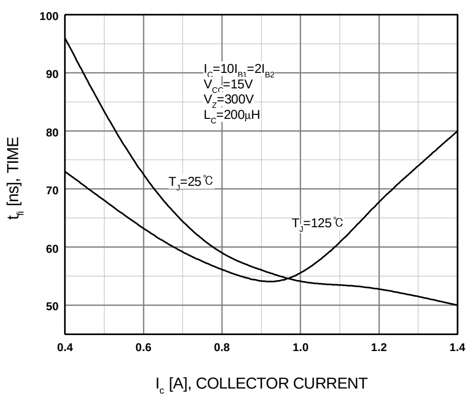


Figure 15. Inductive Switching Time, t_{fi}

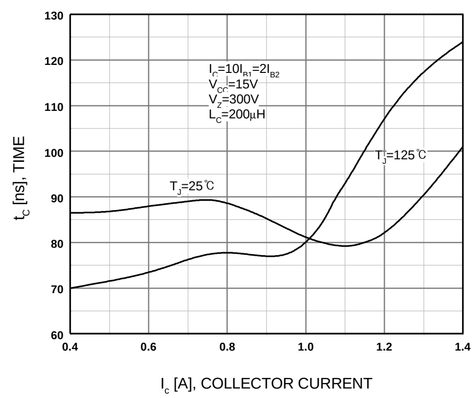


Figure 16. Inductive Switching Time, t_c

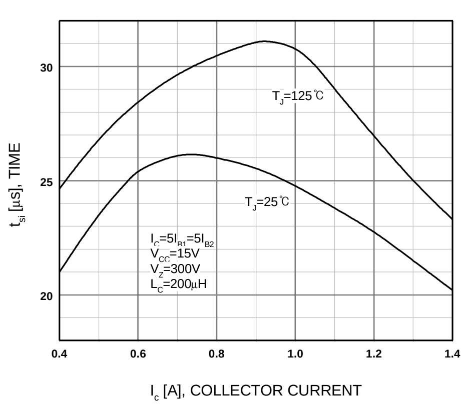


Figure 17. Inductive Switching Time, t_{si}

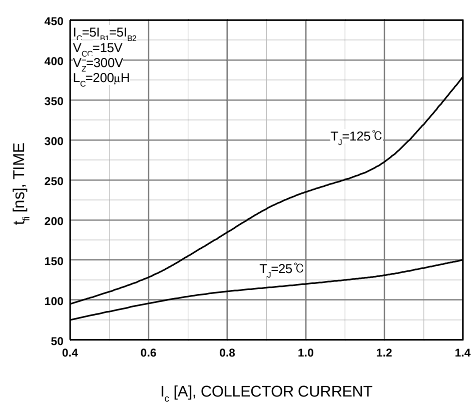


Figure 18. Inductive Switching Time, t_{fi}

Typical Characteristics (Continued)

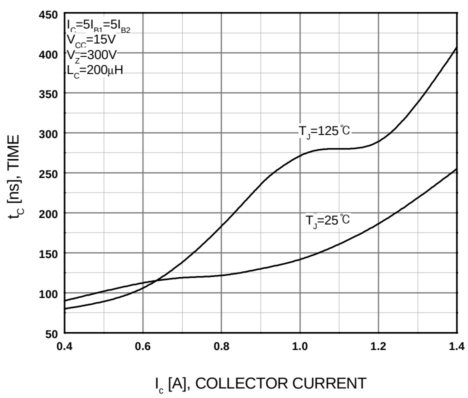


Figure 19. Inductive Switching Time, t_c

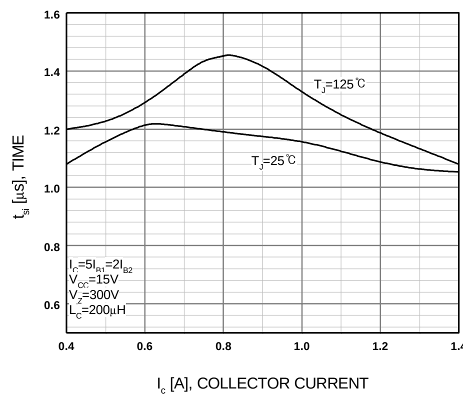


Figure 20. Inductive Switching Time, t_{si}

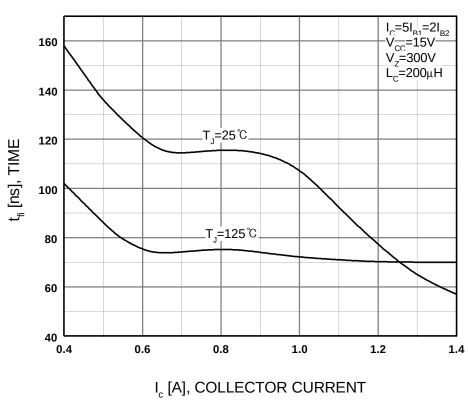


Figure 21. Inductive Switching Time, t_{fi}

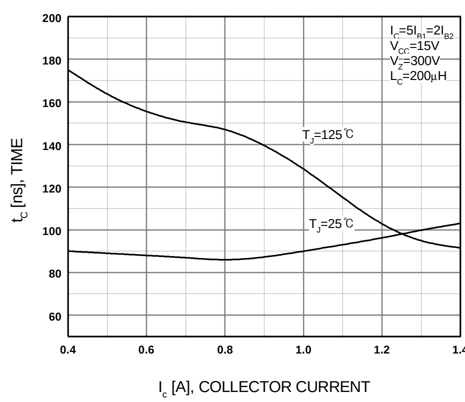


Figure 22. Inductive Switching Time, t_c

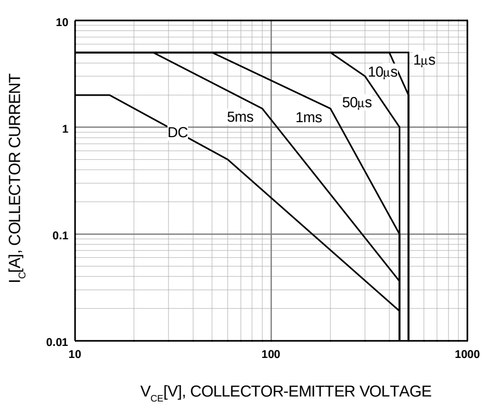


Figure 23. Forward Bias Safe Operating Area

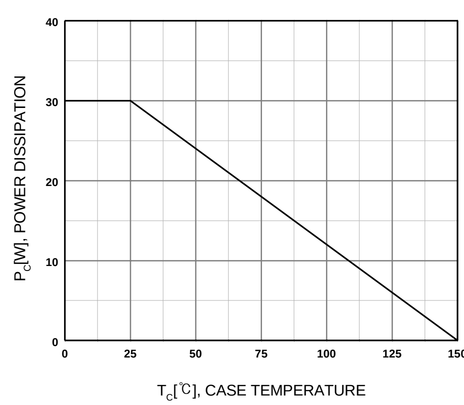
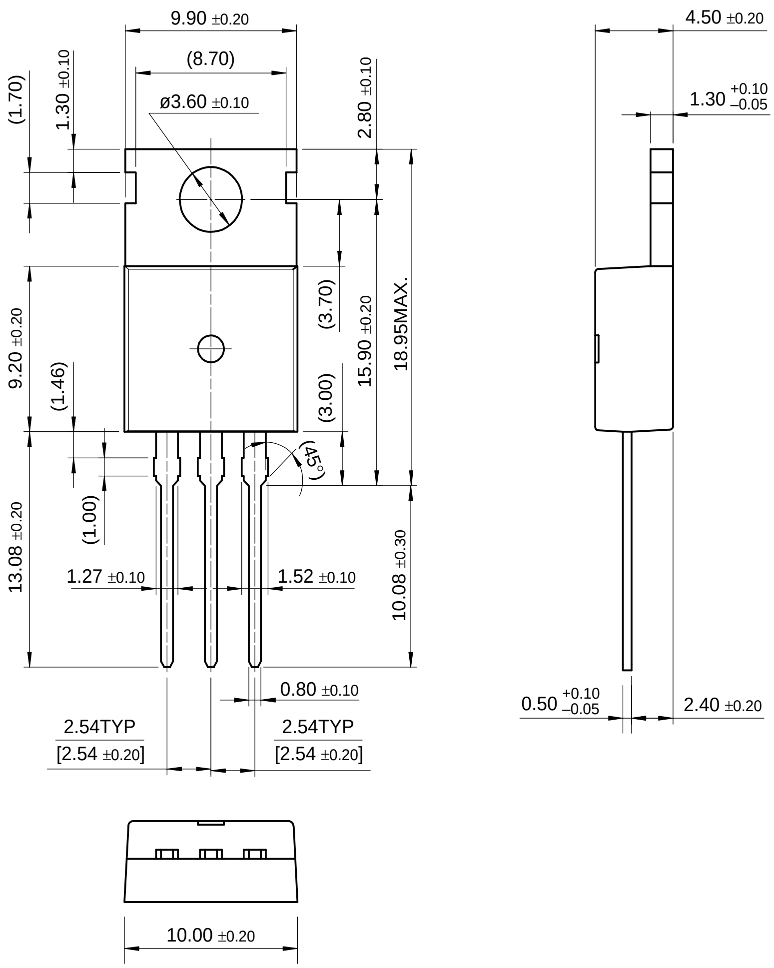


Figure 24. Power Derating

Package Dimensions

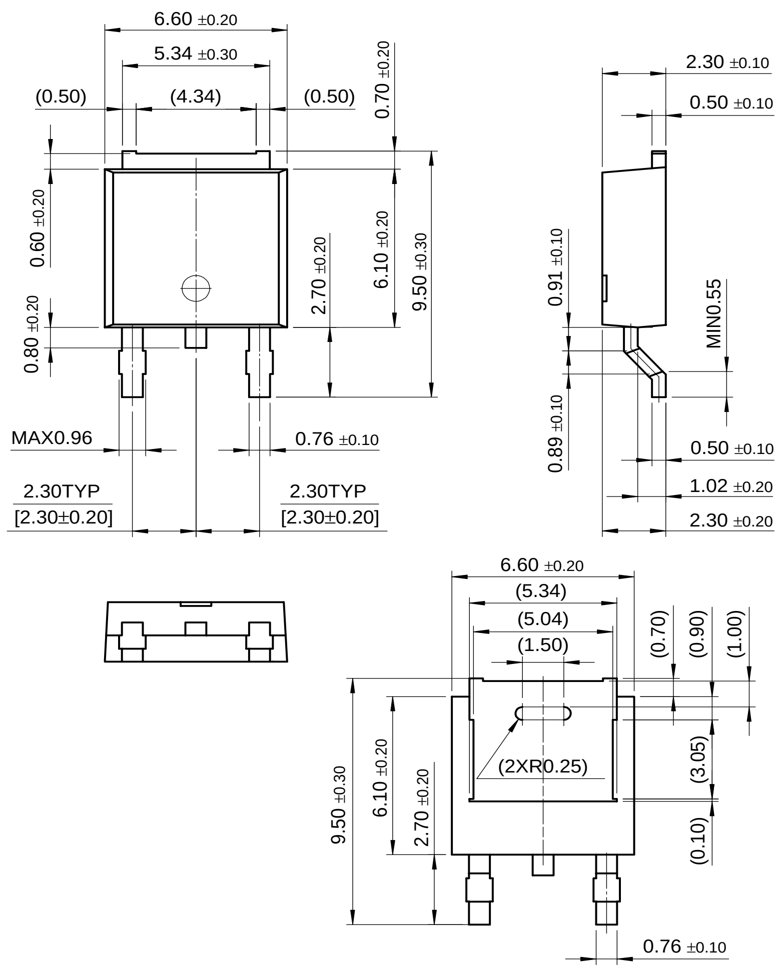
TO-220



Dimensions in Millimeters

Package Dimensions (Continued)

D-PAK



Dimensions in Millimeters

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CoolFET™	FASTr™	MicroFET™	PowerTrench®	SuperSOT™-6
CROSSVOLT™	FRFET™	MicroPak™	QFET™	SuperSOT™-8
DOME™	GlobalOptoisolator™	MICROWIRE™	QS™	SyncFET™
EcoSPARK™	GTO™	MSX™	QT Optoelectronics™	TinyLogic™
E^2CMOS™	HiSeC™	MSXPro™	Quiet Series™	TruTranslation™
EnSigna™	I^2C™	OCX™	RapidConfigure™	UHC™
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Programmable Active Droop™		OPTOPLANAR™	SMART START™	

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
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