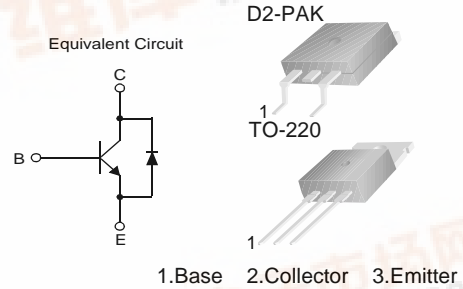


**FAIRCHILD**  
SEMICONDUCTOR®

## KSC5504D/KSC5504DT

### 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 : D2-PAK or TO-220



### NPN Triple Diffused Planar Silicon Transistor

#### Absolute Maximum Ratings $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Value	Units
$V_{CBO}$	Collector-Base Voltage	1200	V
$V_{CEO}$	Collector-Emitter Voltage	600	V
$V_{EBO}$	Emitter-Base Voltage	12	V
$I_C$	Collector Current (DC)	4	A
$I_{CP}$	*Collector Current (Pulse)	8	A
$I_B$	Base Current (DC)	2	A
$I_{BP}$	*Base Current (Pulse)	4	A
$P_C$	Collector Dissipation ( $T_C=25^\circ\text{C}$ )	75	W
$T_J$	Junction Temperature	150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature	- 65 ~ 150	$^\circ\text{C}$
$E_{AS}$	Avalanche Energy( $T_J=25^\circ\text{C}$ )	3	mJ

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

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

Symbol	Characteristics	Rating	Unit
$R_{\theta jc}$	Thermal Resistance	Junction to Case	1.65
$R_{\theta ja}$		Junction to Ambient	62.5
$T_L$	Maximun Lead Temperature for Soldering Purpose : 1/8" from Case for 5 seconds	270	$^\circ\text{C}$

KSC5504D/KSC5504DT

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

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units	
$BV_{CBO}$	Collector-Base Breakdown Voltage	$I_C=1\text{mA}, I_E=0$	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	$I_E=500\mu\text{A}, I_C=0$	12	13.7		V	
$I_{CES}$	Collector Cut-off Current	$V_{CES}=1200\text{V}, V_{BE}=0$	$T_C=25^\circ\text{C}$		100	$\mu\text{A}$	
			$T_C=125^\circ\text{C}$		500		
$I_{CEO}$	Collector Cut-off Current	$V_{CE}=600\text{V}, I_B=0$	$T_C=25^\circ\text{C}$		100	$\mu\text{A}$	
			$T_C=125^\circ\text{C}$		500		
$I_{EBO}$	Emitter Cut-off Current	$V_{EB}=12\text{V}, I_C=0$			10	$\mu\text{A}$	
$h_{FE}$	DC Current Gain	$V_{CE}=1\text{V}, I_C=0.5\text{A}$	$T_C=25^\circ\text{C}$	15	20	35	
			$T_C=125^\circ\text{C}$	10	13		
		$V_{CE}=1\text{V}, I_C=2\text{A}$	$T_C=25^\circ\text{C}$	4	6		
			$T_C=125^\circ\text{C}$	3	4.1		
		$V_{CE}=2.5\text{V}, I_C=1\text{A}$	$T_C=25^\circ\text{C}$	12	18	30	
			$T_C=125^\circ\text{C}$	8	10		
$V_{CE}(\text{sat})$	Collector-Emitter Saturation Voltage	$I_C=0.5\text{A}, I_B=0.05\text{A}$	$T_C=25^\circ\text{C}$		0.28	0.6	V
			$T_C=125^\circ\text{C}$		0.5	1.0	V
		$I_C=1\text{A}, I_B=0.2\text{A}$	$T_C=25^\circ\text{C}$		0.18	0.5	V
			$T_C=125^\circ\text{C}$		0.3	0.75	V
		$I_C=2\text{A}, I_B=0.4\text{A}$	$T_C=25^\circ\text{C}$		0.5	1.5	V
			$T_C=125^\circ\text{C}$		2.0	3.0	V
$V_{BE}(\text{sat})$	Base-Emitter Saturation Voltage	$I_C=0.8\text{A}, I_B=0.08\text{A}$	$T_C=25^\circ\text{C}$		0.77	1.0	V
			$T_C=125^\circ\text{C}$		0.60	0.9	V
		$I_C=2\text{A}, I_B=0.4\text{A}$	$T_C=25^\circ\text{C}$		0.85	1.2	V
			$T_C=125^\circ\text{C}$		0.70	1.0	V
$C_{ib}$	Input Capacitance	$V_{EB}=10\text{V}, I_C=0, f=1\text{MHz}$		600	750	pF	
$C_{ob}$	Output Capacitance	$V_{CB}=10\text{V}, I_E=0, f=1\text{MHz}$		75	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	$I_F=1\text{A}$	$T_C=25^\circ\text{C}$		0.83	1.3	V
			$T_C=125^\circ\text{C}$		0.7		V
		$I_F=2\text{A}$	$T_C=25^\circ\text{C}$		0.88	1.5	V
			$T_C=125^\circ\text{C}$		0.8		V

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

Symbol	Parameter	Test Condition	Min	Typ.	Max.	Units	
$t_{fr}$	Diode Forward Recovery Time ( $di/dt=10\text{A}/\mu\text{s}$ )	$I_F=0.4\text{A}$		770		ns	
		$I_F=1\text{A}$		870		ns	
		$I_F=2\text{A}$		1.2		$\mu\text{s}$	
$V_{CE(DSAT)}$	Dynamic Saturation Voltage	$I_C=1\text{A}$ , $I_{B1}=100\text{mA}$ $V_{CC}=300\text{V}$	@ $1\mu\text{s}$	10		V	
			@ $3\mu\text{s}$	3		V	
		$I_C=2\text{A}$ , $I_{B1}=400\text{mA}$ $V_{CC}=300\text{V}$	@ $1\mu\text{s}$	10		V	
			@ $3\mu\text{s}$	2		V	
RESISTIVE LOAD SWITCHING (D.C. $\leq 10\%$ , Pulse Width= $40\mu\text{s}$ )							
$t_{ON}$	Turn ON Time	$I_C=2\text{A}$ , $I_{B1}=0.4\text{A}$ $I_{B2}=1\text{A}$ , $V_{CC}=300\text{V}$ $R_L = 150\Omega$	$T_C=25^\circ\text{C}$		160	250	ns
			$T_C=125^\circ\text{C}$		170		ns
$t_{STG}$	Storage Time		$T_C=25^\circ\text{C}$		1.5	2.5	$\mu\text{s}$
			$T_C=125^\circ\text{C}$		1.7		$\mu\text{s}$
$t_F$	Fall Time		$T_C=25^\circ\text{C}$		125	300	ns
			$T_C=125^\circ\text{C}$		160		ns
$t_{ON}$	Turn ON Time	$I_C=2\text{A}$ , $I_{B1}=0.4\text{A}$ $I_{B2}=0.4\text{A}$ , $V_{CC}=300\text{V}$ $R_L = 150\Omega$	$T_C=25^\circ\text{C}$		170	300	ns
			$T_C=125^\circ\text{C}$		175		ns
$t_{STG}$	Storage Time		$T_C=25^\circ\text{C}$		2.8	3.5	$\mu\text{s}$
			$T_C=125^\circ\text{C}$		3.1		$\mu\text{s}$
$t_F$	Fall Time		$T_C=25^\circ\text{C}$		400	650	ns
			$T_C=125^\circ\text{C}$		850		ns
INDUCTIVE LOAD SWITCHING ( $V_{CC}=15\text{V}$ )							
$t_{STG}$	Storage Time	$I_C=2\text{A}$ , $I_{B1}=0.4\text{A}$ $I_{B2}=1\text{A}$ , $V_Z=300\text{V}$ $L_C=200\text{H}$	$T_C=25^\circ\text{C}$		1.75	2.5	$\mu\text{s}$
			$T_C=125^\circ\text{C}$		2.2		$\mu\text{s}$
$t_F$	Fall Time		$T_C=25^\circ\text{C}$		100	250	ns
			$T_C=125^\circ\text{C}$		100		ns
$t_C$	Cross-over Time		$T_C=25^\circ\text{C}$		210	400	ns
			$T_C=125^\circ\text{C}$		250		ns
$t_{STG}$	Storage Time	$I_C=2\text{A}$ , $I_{B1}=0.4\text{A}$ $I_{B2}=0.4\text{A}$ , $V_{CC}=300\text{V}$ $L_C=200\text{H}$	$T_C=25^\circ\text{C}$		3.6	4.5	$\mu\text{s}$
			$T_C=125^\circ\text{C}$		4.2		$\mu\text{s}$
$t_F$	Fall Time		$T_C=25^\circ\text{C}$		170	350	ns
			$T_C=125^\circ\text{C}$		320		ns
$t_C$	Cross-over Time		$T_C=25^\circ\text{C}$		540	800	ns
			$T_C=125^\circ\text{C}$		1.1		ns

# Typical Characteristics

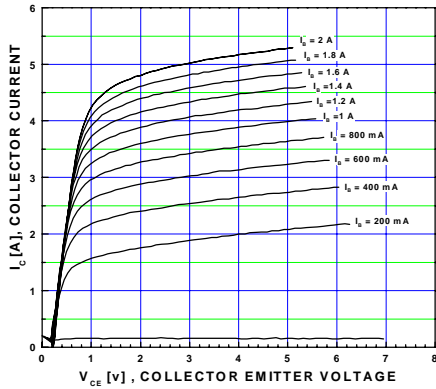


Figure 1. Static Characteristic

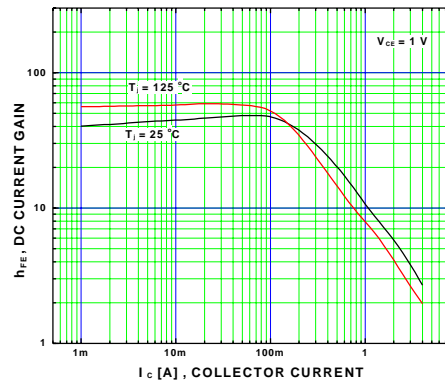


Figure 2. DC current Gain

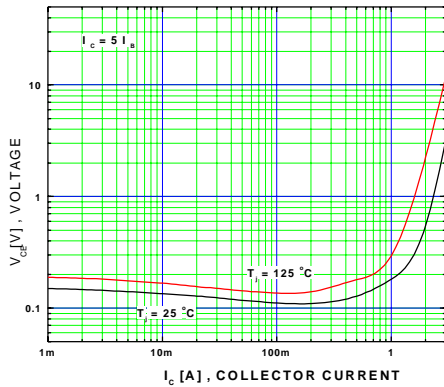


Figure 3. Collector-Emitter Saturation Voltage

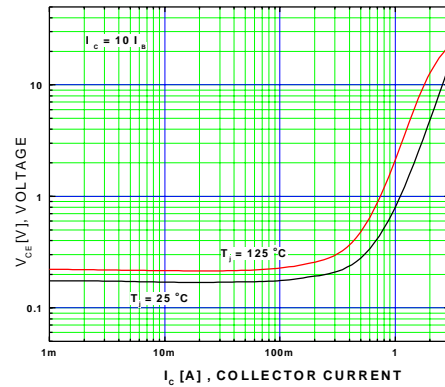


Figure 4. Collector-Emitter Saturation Voltage

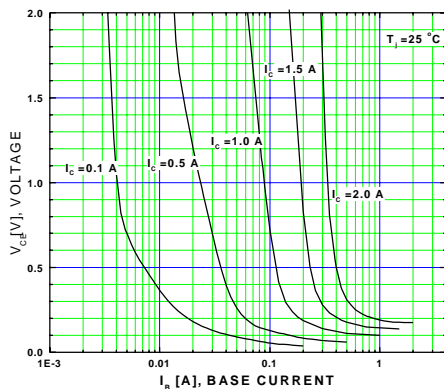


Figure 5. Typical Collector Saturation Voltage

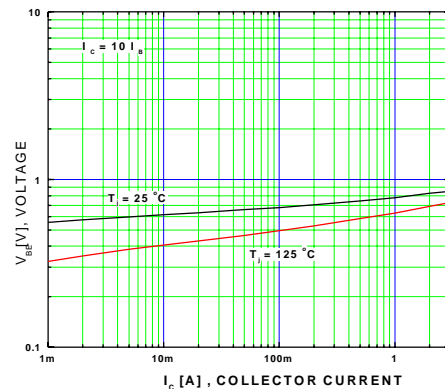


Figure 6. Base-Emitter Saturation Voltage

Typical Characteristics (Continued)

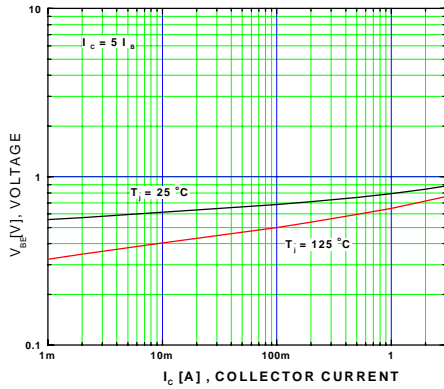


Figure 7. Base-Emitter Saturation Voltage

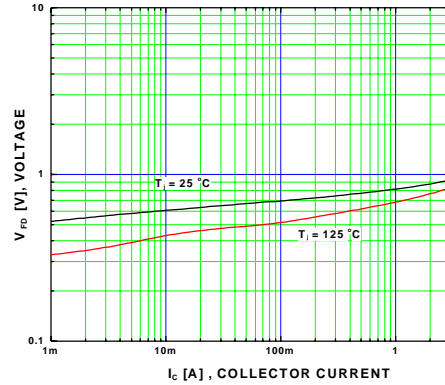


Figure 8. Diode Forward Voltage

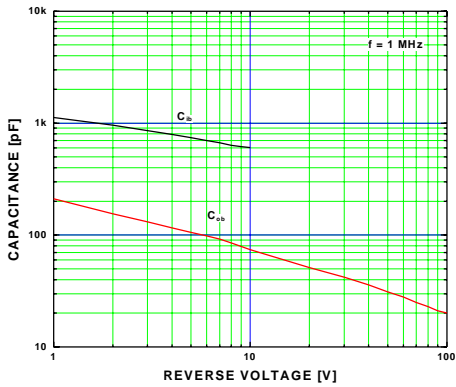


Figure 9. Collector Output Capacitance

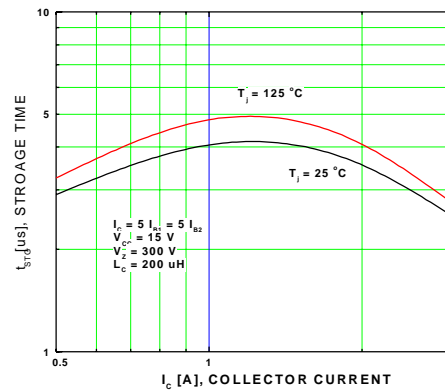


Figure 10. Inductive Switching Time,  $t_{si}$

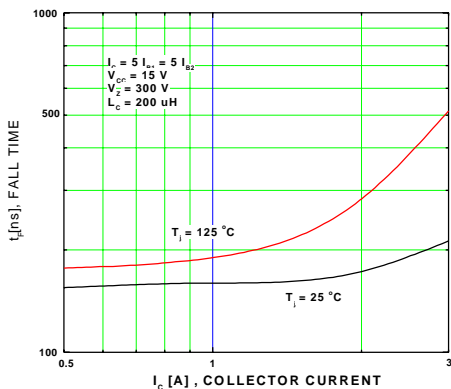


Figure 11. Inductive Switching Time,  $t_{fi}$

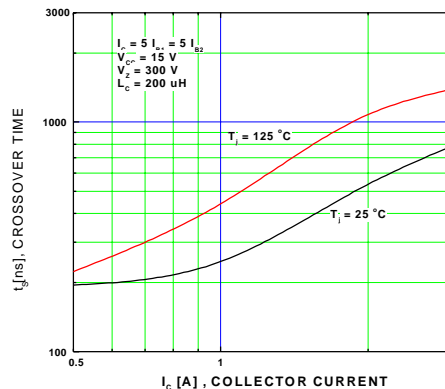


Figure 12. Inductive Switching Time,  $t_{ci}$

Typical Characteristics (Continued)

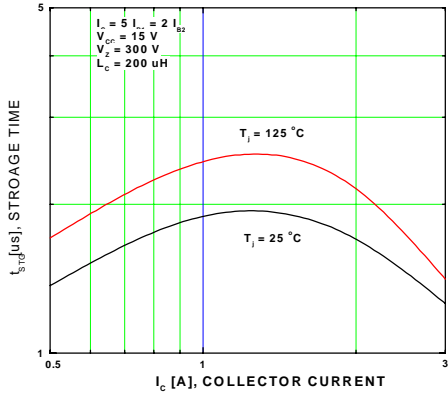


Figure 13. Inductive Switching Time,  $t_{sj}$

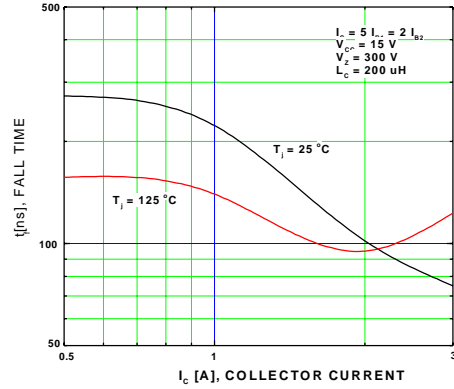


Figure 14. Inductive Switching Time,  $t_{fi}$

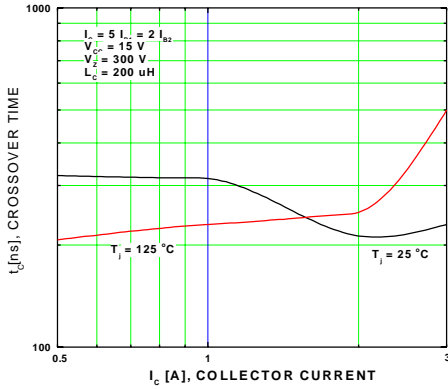


Figure 15. Inductive Switching Time,  $t_c$

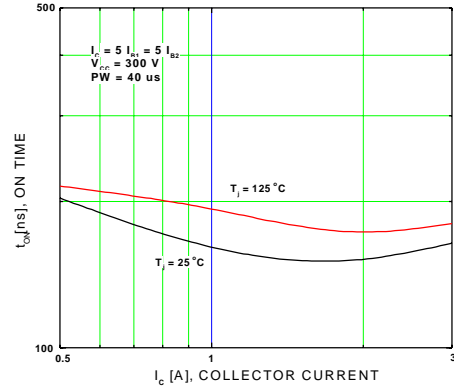


Figure 16. Resistive Switching Time,  $t_{on}$

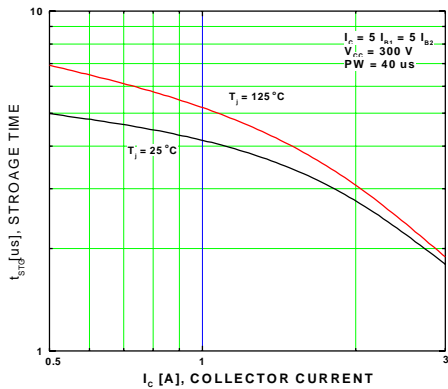


Figure 17. Resistive Switching Time,  $t_{sj}$

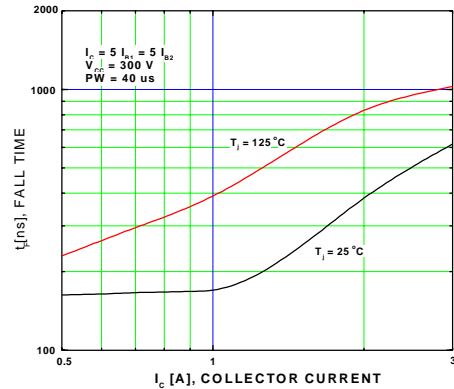


Figure 18. Resistive Switching Time,  $t_{fi}$

Typical Characteristics (Continued)

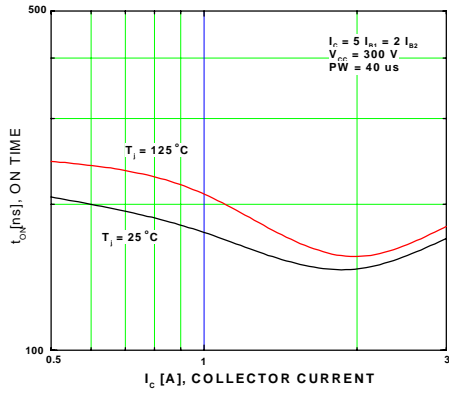


Figure 19. Resistive Switching Time,  $t_{on}$

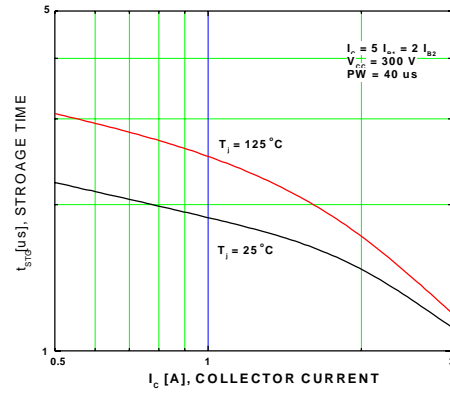


Figure 20. Resistive Switching Time,  $t_{si}$

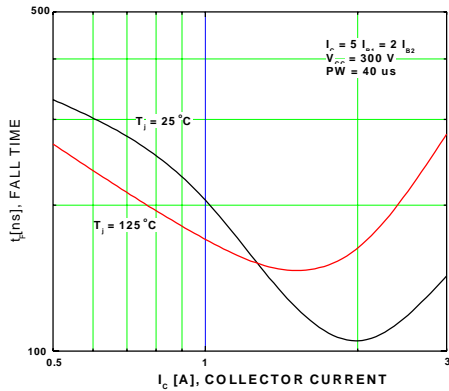


Figure 21. Resistive Switching Time,  $t_{fi}$

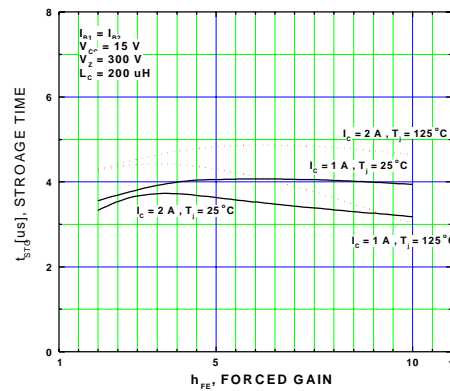


Figure 22. Inductive Switching Time,  $t_{si}$

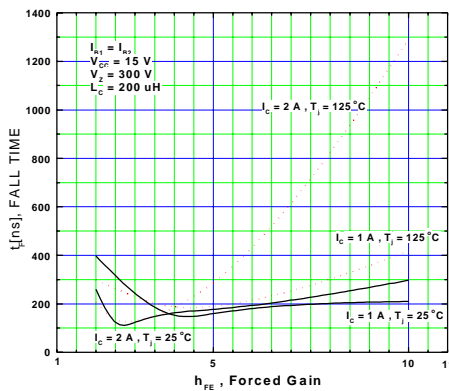


Figure 23. Inductive Switching Time,  $t_{fi}$

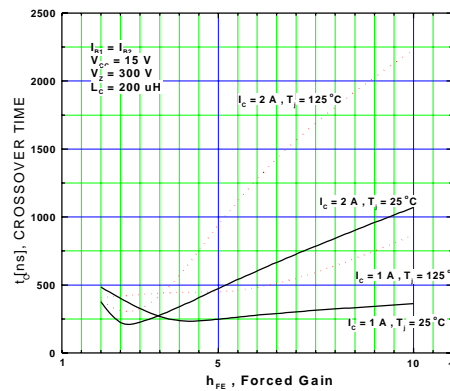


Figure 24. Inductive Switching Time,  $t_c$

### Typical Characteristics (Continued)

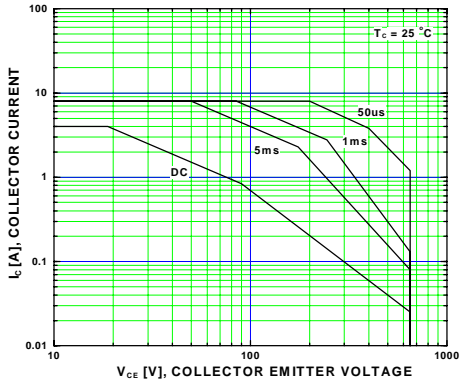


Figure 25. Forward Bias Safe Operating Area

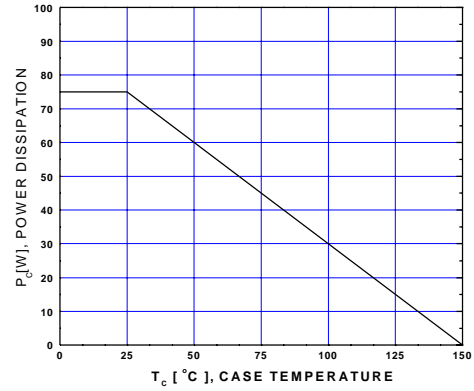


Figure 26. Power Derating





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DenseTrench™	GTO™	PowerTrench <sup>®</sup>	SuperSOT™-8
DOME™	HiSeC™	QFET™	SyncFET™
EcoSPARK™	ISOPLANAR™	QS™	TruTranslation™
E <sup>2</sup> CMOS™	LittleFET™	QT Optoelectronics™	TinyLogic™
EnSigna™	MicroFET™	Quiet Series™	UHC™
FACT™	MICROWIRE™	SLIENT SWITCHER <sup>®</sup>	UltraFET <sup>®</sup>
FACT Quiet Series™	OPTOLOGIC™	SMART START™	VCX™

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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

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Datasheet Identification	Product Status	Definition
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