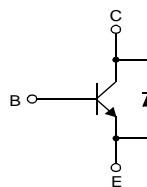


## KSC5502D/KSC5502DT

### 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

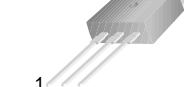
Equivalent Circuit



D-PAK



TO-220



1.Base 2.Collector 3.Emitter

### 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)	2	A
$I_{CP}$	*Collector Current (Pulse)	4	A
$I_B$	Base Current (DC)	1	A
$I_{BP}$	*Base Current (Pulse)	2	A
$P_C$	Collector Dissipation ( $T_C=25^\circ\text{C}$ )	50	W
$T_J$	Junction Temperature	150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature	- 65 ~ 150	$^\circ\text{C}$
EAS	Avalanche Energy( $T_J=25^\circ\text{C}$ )	2.5	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	2.5	$^\circ\text{C}/\text{W}$
$R_{\theta ja}$		Junction to Ambient	62.5	
$T_L$	Maximun Lead Temperature for Soldering Purpose : 1/8" from Case for 5 seconds		270	$^\circ\text{C}$

**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	$V_{CE}=1\text{V}, I_C=0.2\text{A}$	$T_C=25^\circ\text{C}$	15	28	40	
			$T_C=125^\circ\text{C}$	8	18		
		$V_{CE}=1\text{V}, I_C=1\text{A}$	$T_C=25^\circ\text{C}$	4	6.4		
			$T_C=125^\circ\text{C}$	3	4.7		
		$V_{CE}=2.5\text{V}, I_C=0.5\text{A}$	$T_C=25^\circ\text{C}$	12	20	30	
			$T_C=125^\circ\text{C}$	6	12		
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=0.2\text{A}, I_B=0.02\text{A}$	$T_C=25^\circ\text{C}$		0.31	0.8	V
			$T_C=125^\circ\text{C}$		0.54	1.1	V
		$I_C=0.4\text{A}, I_B=0.08\text{A}$	$T_C=25^\circ\text{C}$		0.15	0.6	V
			$T_C=125^\circ\text{C}$		0.23	1.0	V
		$I_C=1\text{A}, I_B=0.2\text{A}$	$T_C=25^\circ\text{C}$		0.40	1.5	V
			$T_C=125^\circ\text{C}$		1.3	3.0	V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	$I_C=0.4\text{A}, I_B=0.08\text{A}$	$T_C=25^\circ\text{C}$		0.77	1.0	V
			$T_C=125^\circ\text{C}$		0.60	0.9	V
		$I_C=1\text{A}, I_B=0.2\text{A}$	$T_C=25^\circ\text{C}$		0.83	1.2	V
			$T_C=125^\circ\text{C}$		0.70	1.0	V
$C_{ib}$	Input Capacitance	$V_{EB}=8\text{V}, I_C=0, f=1\text{MHz}$		385	500	pF	
$C_{ob}$	Output Capacitance	$V_{CB}=10\text{V}, I_E=0, f=1\text{MHz}$		60	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	$I_F=0.2\text{A}$	$T_C=25^\circ\text{C}$		0.75	1.2	V
			$T_C=125^\circ\text{C}$		0.59		V
		$I_F=0.4\text{A}$	$T_C=25^\circ\text{C}$		0.80	1.3	V
			$T_C=125^\circ\text{C}$		0.64		V
		$I_F=1\text{A}$	$T_C=25^\circ\text{C}$		0.9	1.5	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 ( $di/dt=10\text{A}/\mu\text{s}$ )	$I_F=0.2\text{A}$		650		ns	
		$I_F=0.4\text{A}$		740		ns	
		$I_F=1\text{A}$		785		ns	
$V_{CE(DSAT)}$	Dynamic Saturation Voltage	$I_C=0.4\text{A}, I_{B1}=80\text{mA}$ $V_{CC}=300\text{V}$	@ $1\mu\text{s}$	7.2		V	
			@ $3\mu\text{s}$	1.8		V	
		$I_C=1\text{A}, I_{B1}=200\text{mA}$ $V_{CC}=300\text{V}$	@ $1\mu\text{s}$	18		V	
			@ $3\mu\text{s}$	6		V	
RESISTIVE LOAD SWITCHING (D.C. $\leq 10\%$ , Pulse Width=20s)							
$t_{ON}$	Turn On Time	$I_C=0.4\text{A},$ $I_{B1}=80\text{mA}$	$T_C=25^\circ\text{C}$		175	350	ns
			$T_C=125^\circ\text{C}$		185		ns
$t_{OFF}$	Turn Off Time	$I_{B2}=0.2\text{A},$ $V_{CC}=300\text{V}$ $R_L = 750\Omega$	$T_C=25^\circ\text{C}$		2.1	3.0	$\mu\text{s}$
			$T_C=125^\circ\text{C}$		2.6		$\mu\text{s}$
$t_{ON}$	Turn On Time	$I_C=1\text{A},$ $I_{B1}=160\text{mA}$	$T_C=25^\circ\text{C}$		240	450	ns
			$T_C=125^\circ\text{C}$		310		ns
$t_{OFF}$	Turn Off Time	$I_{B2}=160\text{mA},$ $V_{CC}=300\text{V}$ $R_L = 300\Omega$	$T_C=25^\circ\text{C}$		3.7	5.0	$\mu\text{s}$
			$T_C=125^\circ\text{C}$		4.5		$\mu\text{s}$
INDUCTIVE LOAD SWITCHING ( $V_{CC}=15\text{V}$ )							
$t_{STG}$	Storage Time	$I_C=0.4\text{A},$ $I_{B1}=80\text{mA}$	$T_C=25^\circ\text{C}$		1.2	2.0	$\mu\text{s}$
			$T_C=125^\circ\text{C}$		1.5		$\mu\text{s}$
$t_F$	Fall Time	$I_{B2}=0.2\text{A},$ $V_Z=300\text{V}$ $L_C=200\text{H}$	$T_C=25^\circ\text{C}$		90	200	ns
			$T_C=125^\circ\text{C}$		65		ns
$t_C$	Cross-over Time		$T_C=25^\circ\text{C}$		185	350	ns
			$T_C=125^\circ\text{C}$		145		ns
$t_{STG}$	Storage Time	$I_C=0.8\text{A},$ $I_{B1}=160\text{mA}$	$T_C=25^\circ\text{C}$		3.3	4.5	$\mu\text{s}$
			$T_C=125^\circ\text{C}$		3.75		$\mu\text{s}$
$t_F$	Fall Time	$I_{B2}=160\text{mA},$ $V_{CC}=300\text{V}$ $L_C=200\text{H}$	$T_C=25^\circ\text{C}$		90	250	ns
			$T_C=125^\circ\text{C}$		160		ns
$t_C$	Cross-over Time		$T_C=25^\circ\text{C}$		300	600	ns
			$T_C=125^\circ\text{C}$		570		ns

# Typical Characteristics

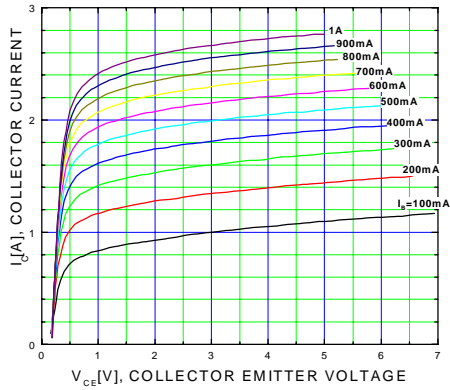


Figure 1. Static Characteristic

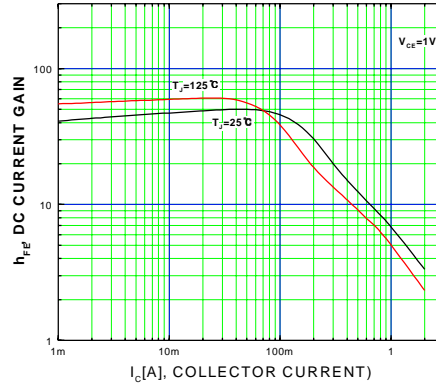


Figure 2. DC current Gain

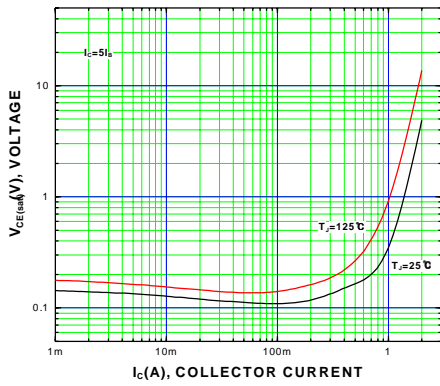


Figure 3. Collector-Emitter Saturation Voltage

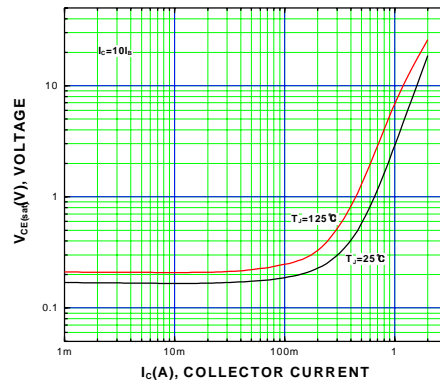


Figure 4. Collector-Emitter Saturation Voltage

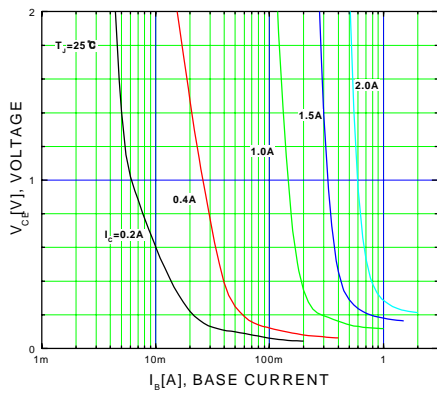


Figure 5. Typical Collector Saturation Voltage

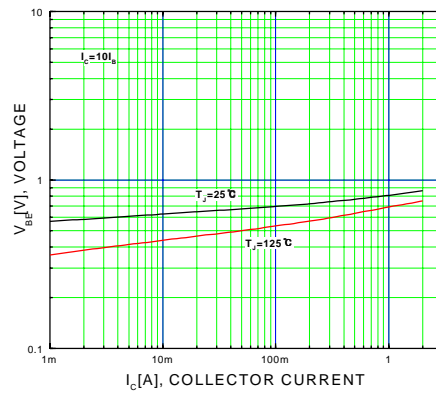


Figure 6. Base-Emitter Saturation Voltage

Typical Characteristics (Continued)

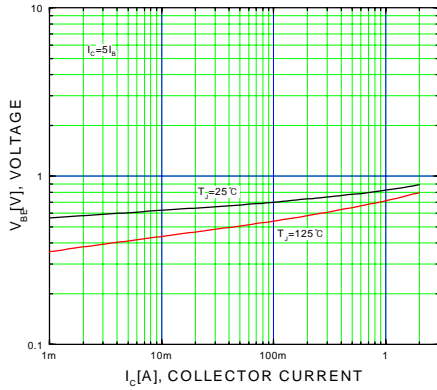


Figure 7. Base-Emitter Saturation Voltage

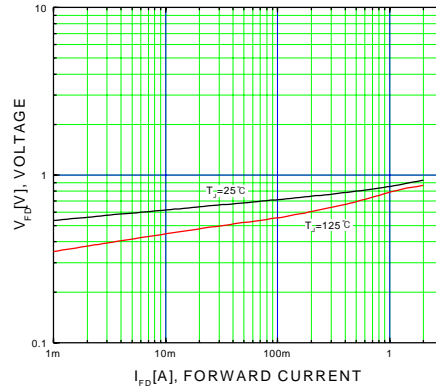


Figure 8. Diode Forward Voltage

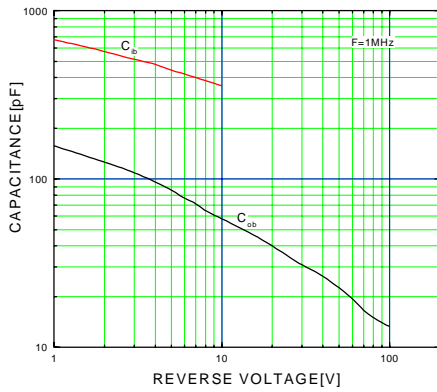


Figure 9. Collector Output Capacitance

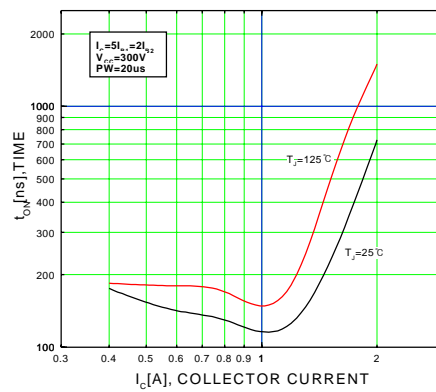


Figure 10. Resistive Switching Time,  $t_{on}$

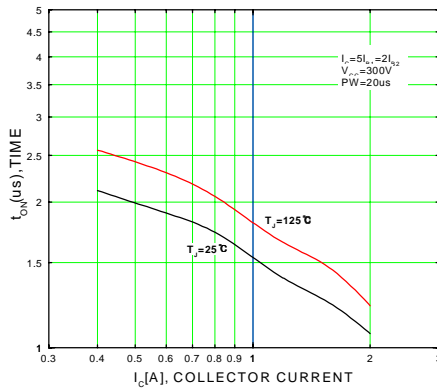


Figure 11. Resistive Switching Time,  $t_{off}$

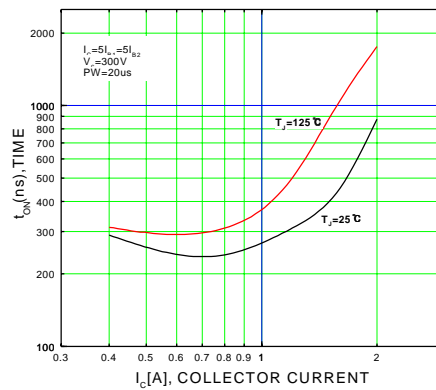


Figure 12. Resistive Switching Time,  $t_{on}$

Typical Characteristics (Continued)

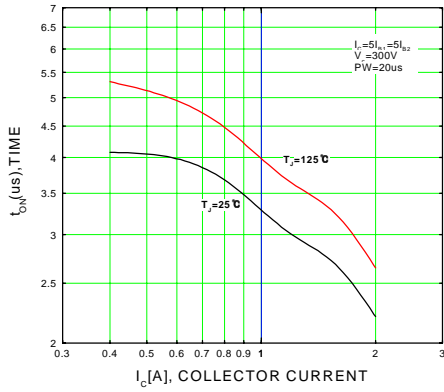


Figure 13. Resistive Switching Time,  $t_{on}$

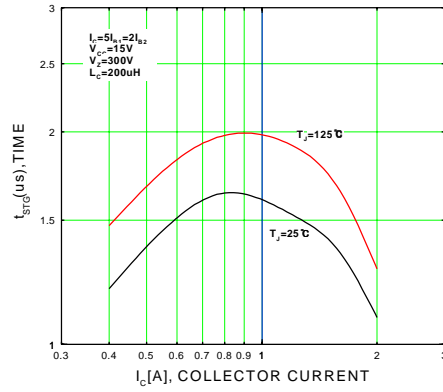


Figure 14. Inductive Switching Time,  $t_{STG}$

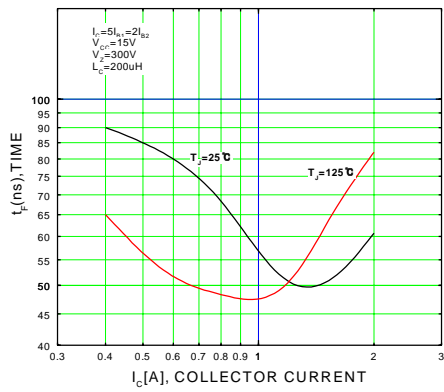


Figure 15. Inductive Switching Time,  $t_f$

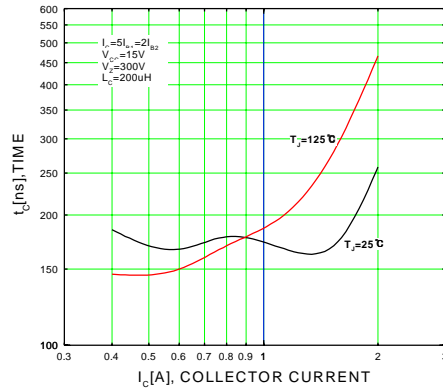


Figure 16. Inductive Switching Time,  $t_c$

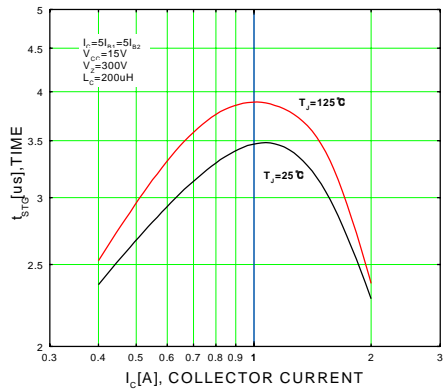


Figure 17. Inductive Switching Time,  $t_{STG}$

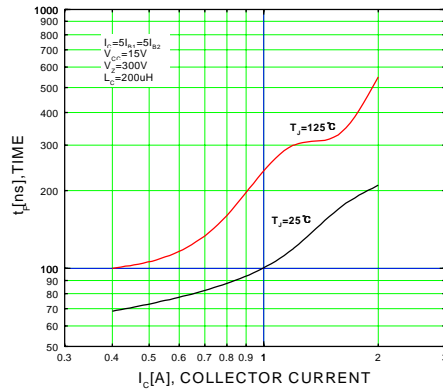


Figure 18. Inductive Switching Time,  $t_f$

Typical Characteristics (Continued)

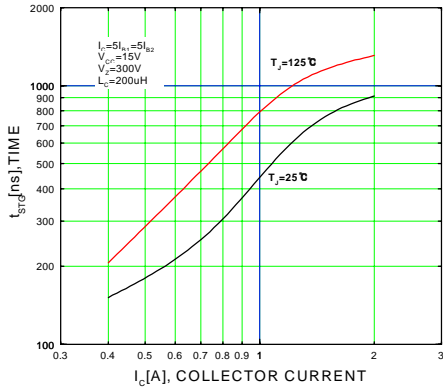


Figure 19. Inductive Switching Time,  $t_c$

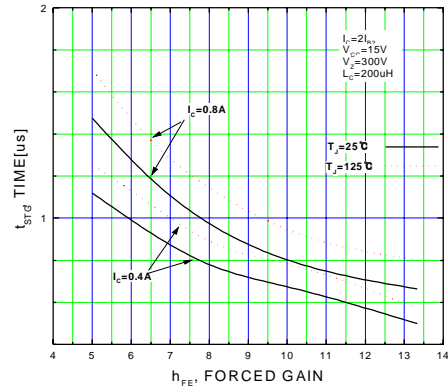


Figure 20. Inductive Switching Time,  $t_{STG}$

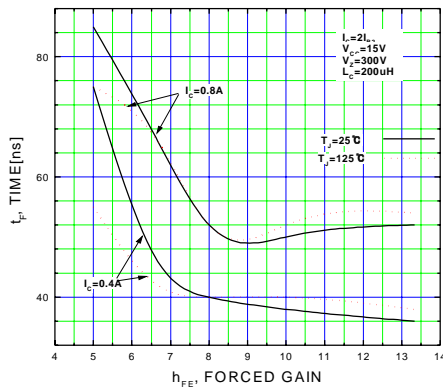


Figure 21. Inductive Switching Time,  $t_f$

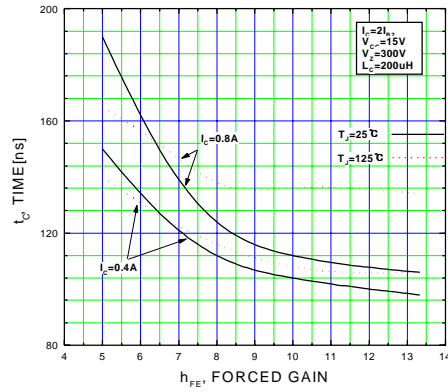


Figure 22. Inductive Switching Time,  $t_c$

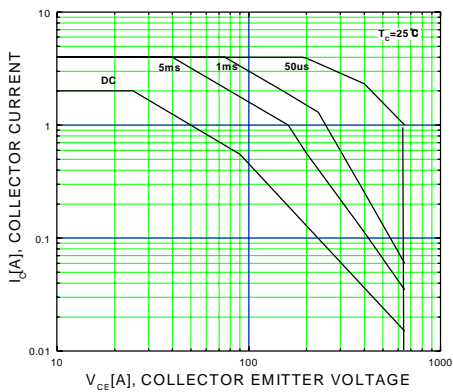


Figure 23. Forward Bias Safe Operating Area

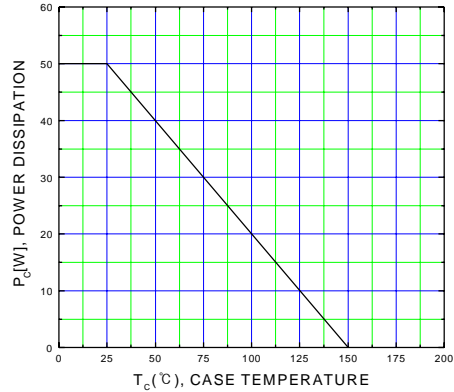


Figure 24. Power Derating

### Typical Characteristics (Continued)

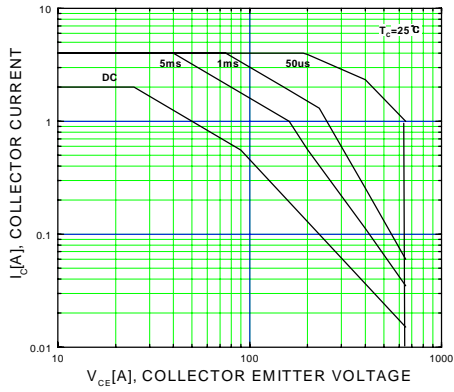


Figure 25. Forward Bias Safe Operating Area

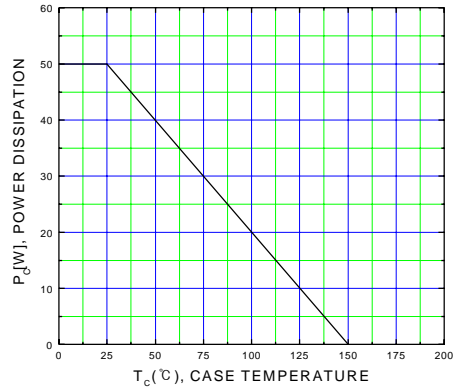
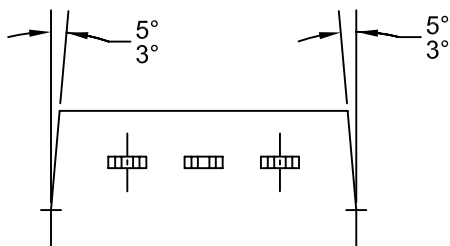
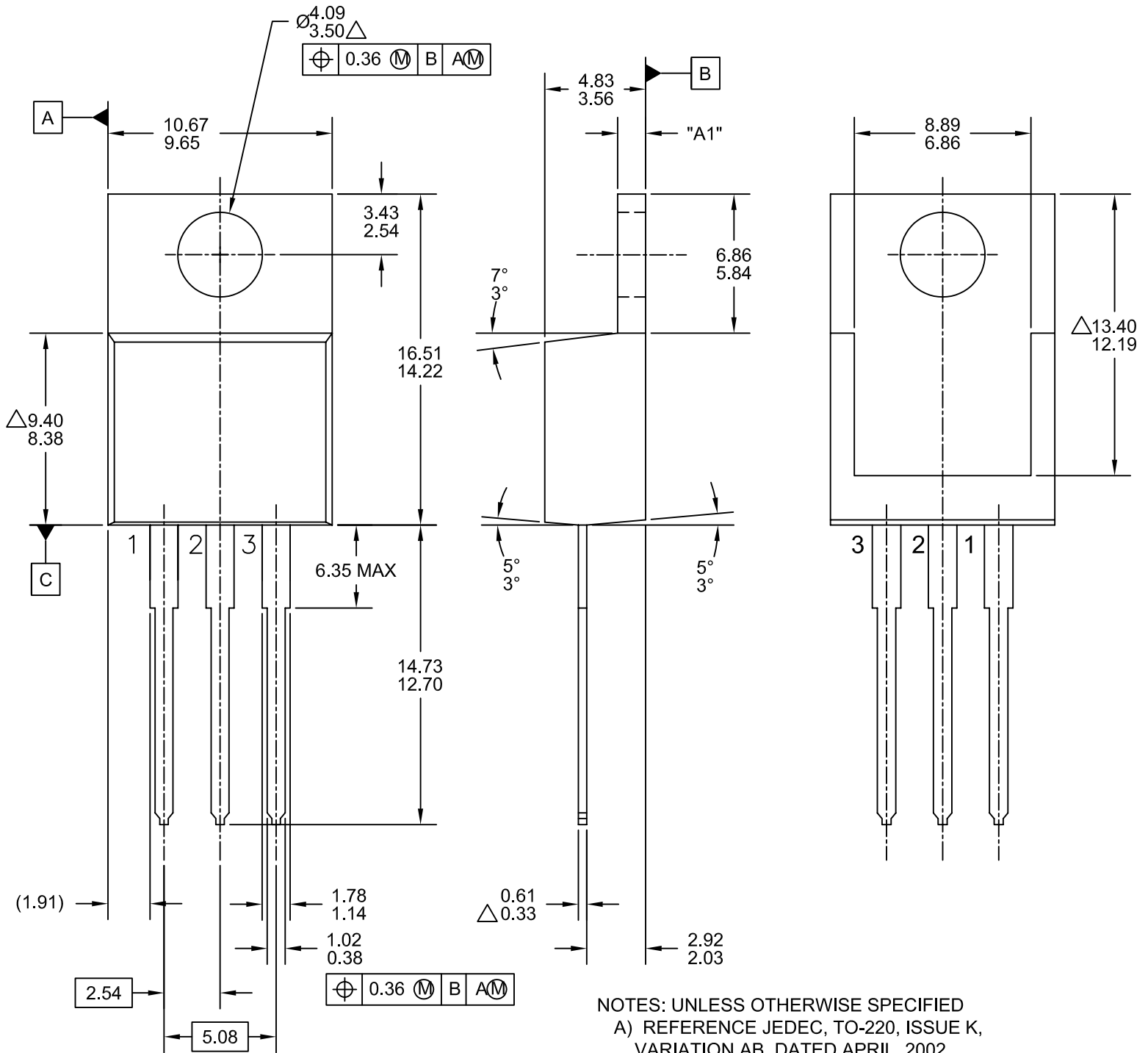


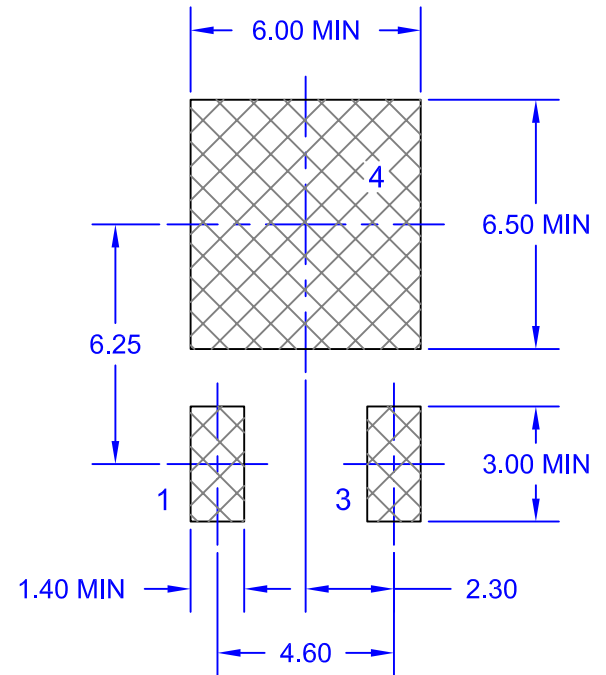
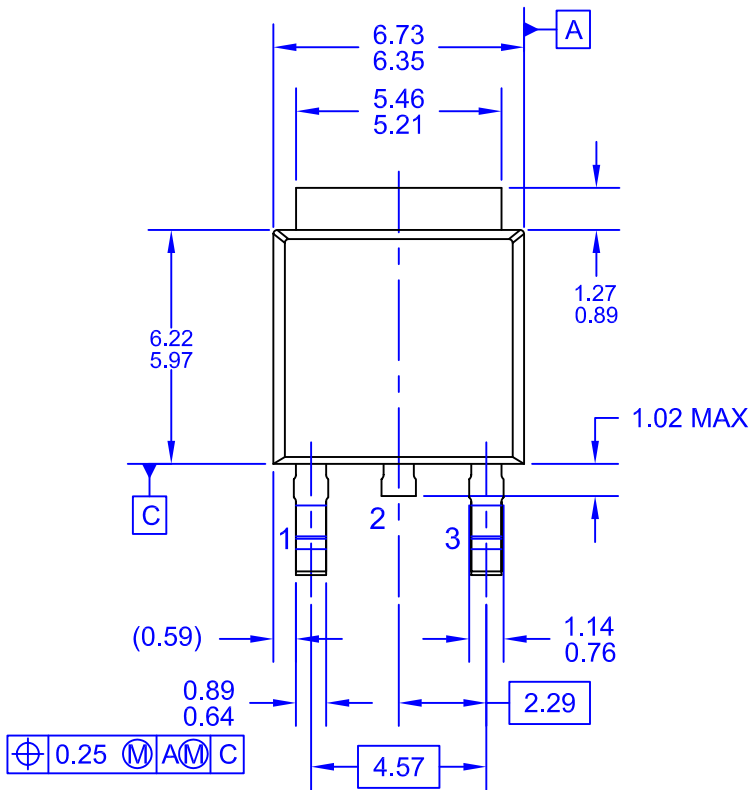
Figure 26. Power Derating



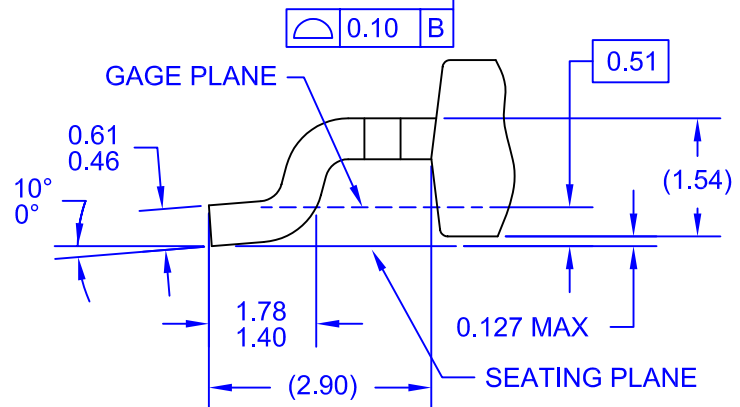
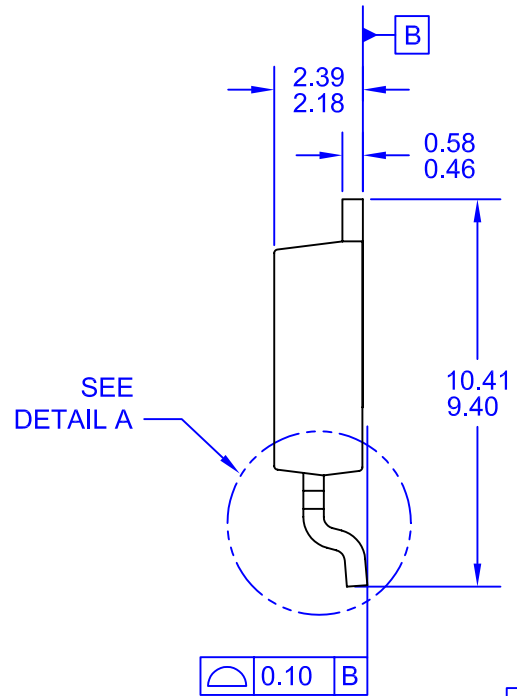
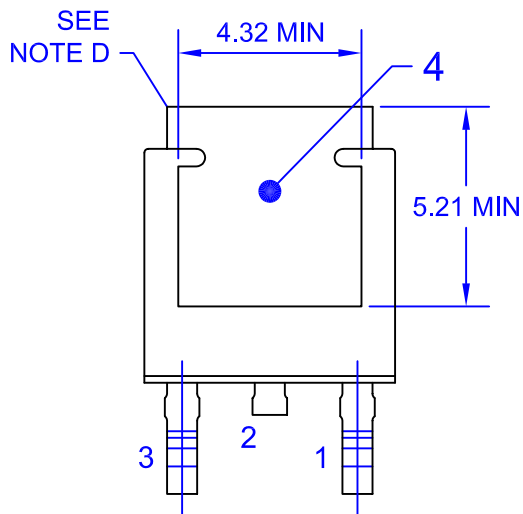
# TO-220

Dimensions are in mm





LAND PATTERN RECOMMENDATION


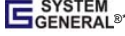





- NOTES: UNLESS OTHERWISE SPECIFIED
- A) THIS PACKAGE CONFORMS TO JEDEC, TO-252, ISSUE C, VARIATION AA.
  - B) ALL DIMENSIONS ARE IN MILLIMETERS.
  - C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
  - D) HEAT SINK TOP EDGE COULD BE IN CHAMFERED CORNERS OR EDGE PROTRUSION.
  - E) PRESENCE OF TRIMMED CENTER LEAD IS OPTIONAL.
  - F) DIMENSIONS ARE EXCLUSIVE OF BURSS, MOLD FLASH AND TIE BAR EXTRUSIONS.
  - G) LAND PATTERN RECOMENDATION IS BASED ON IPC7351A STD TO220P1003X238-3N.
  - H) DRAWING NUMBER AND REVISION: MKT-TO252A03REV8



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| AccuPower™  | F-PFS™   | PowerTrench®  |  |
| AX-CAP®*  | FRFET®   | PowerXS™  | TinyBoost™  |
| BitSiC™   | Global Power Resource <sup>SM</sup>            | Programmable Active Droop™  | TinyBuck™   |
| Build it Now™   | GreenBridge™                                   | QFET®   | TinyCalc™   |
| CorePLUS™   | Green FPS™                                     | QS™   | TinyLogic®  |
| CorePOWER™  | Green FPS™ e-Series™                           | Quiet Series™   | TINYOPTO™   |
| CROSSVOLT™  | Gmax™  | RapidConfigure™   | TinyPower™  |
| CTL™  | GTO™   |  | TinyPWM™  |
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| FACT®   | mWSaver™                                       | SuperSOT™-8   | VisualMax™  |
| FAST®   | OptoHiT™                                       | SupreMOS®   | VoltagePlus™  |
| FastvCore™  | OPTOLOGIC®                                     | SyncFET™  | XS™   |
| FETBench™   | OPTOPLANAR®                                    |   |   |

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2. A critical component in 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.

**ANTI-COUNTERFEITING POLICY**

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, [www.fairchildsemi.com](http://www.fairchildsemi.com), under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

**PRODUCT STATUS DEFINITIONS**

**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.