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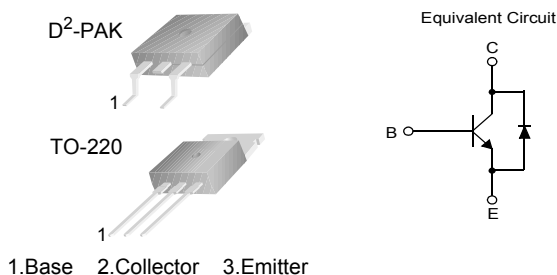


KSC5338D/KSC5338DW

NPN Triple Diffused Planar Silicon Transistor

Features

- 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 : TO-220 or D²-PAK



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)	5	A
I_{CP}	*Collector Current (Pulse)	10	A
I_B	Base Current (DC)	2	A
I_{BP}	*Base Current (Pulse)	4	A
P_C	Power Dissipation ($T_C=25^\circ\text{C}$)	75	W
T_J	Junction Temperature	150	$^\circ\text{C}$
T_{STG}	Storage Temperature	- 55 to 150	$^\circ\text{C}$

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

Thermal Characteristics

Symbol	Parameter	Rating	Units	
$R_{\theta jc}$	Thermal Resistance	Junction to Case	1.65	$^\circ\text{C}/\text{W}$
$R_{\theta ja}$		Junction to Ambient	62.5	$^\circ\text{C}/\text{W}$
T_L	Maximum Lead Temperature for Soldering	270	$^\circ\text{C}$	

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			V	
BV_{CEO}	Collector-Emitter Breakdown Voltage	$I_C=5\text{mA}, I_B=0$	450			V	
BV_{EBO}	Emitter-Base Breakdown Voltage	$I_E=1\text{mA}, I_C=0$	12			V	
I_{CBO}	Collector Cut-off Current	$V_{CB}=800\text{V}, I_E=0$			10	μA	
I_{CES}	Collector Cut-off Current	$V_{CES}=1000\text{V}, I_{EB}=0$	$T_a=25^\circ\text{C}$		100	μA	
			$T_a=125^\circ\text{C}$		500	μA	
I_{CEO}	Collector Cut-off Current	$V_{CE}=450\text{V}, I_B=0$	$T_a=25^\circ\text{C}$		100	μA	
			$T_a=125^\circ\text{C}$		500	μA	
I_{EBO}	Emitter Cut-off Current	$V_{EB}=10\text{V}, I_C=0$			10	μA	
h_{FE}	DC Current Gain	$V_{CE}=1\text{V}, I_C=0.8\text{A}$	$T_a=25^\circ\text{C}$	15	25		
			$T_a=125^\circ\text{C}$	10	14		
		$V_{CE}=1\text{V}, I_C=2\text{A}$	$T_a=25^\circ\text{C}$	6	9		
			$T_a=125^\circ\text{C}$	4	6		
		$V_{CE}=2.5\text{V}, I_C=1\text{A}$	$T_a=25^\circ\text{C}$	18	25		
			$T_a=125^\circ\text{C}$	14	18		
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=0.8\text{A}, I_B=0.08\text{A}$	$T_a=25^\circ\text{C}$		0.35	0.5	V
			$T_a=125^\circ\text{C}$		0.55	0.75	V
		$I_C=2\text{A}, I_B=0.4\text{A}$	$T_a=25^\circ\text{C}$		0.47	0.75	V
			$T_a=125^\circ\text{C}$		0.9	1.1	V
		$I_C=0.8\text{A}, I_B=0.04\text{A}$	$T_a=25^\circ\text{C}$		0.9	1.5	V
			$T_a=125^\circ\text{C}$		1.8	2.5	V
		$I_C=1\text{A}, I_B=0.2\text{A}$	$T_a=25^\circ\text{C}$		0.22	0.5	V
			$T_a=125^\circ\text{C}$		0.3	0.6	V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	$I_C=0.8\text{A}, I_B=0.08\text{A}$	$T_a=25^\circ\text{C}$		0.8	1.0	V
			$T_a=125^\circ\text{C}$		0.65	0.9	V
		$I_C=2\text{A}, I_B=0.4\text{A}$	$T_a=25^\circ\text{C}$		0.9	1.0	V
			$T_a=125^\circ\text{C}$		0.8	0.9	V
C_{ib}	Input Capacitance	$V_{EB}=10\text{V}, I_C=0.5\text{A}, f=1\text{MHz}$		550	750	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	$I_F=1\text{A}, I_C=1\text{mA}, I_E=0$	$T_a=25^\circ\text{C}$		0.86	1.3	V
			$T_a=125^\circ\text{C}$		0.79		V
		$I_F=2\text{A}$	$T_a=25^\circ\text{C}$		0.95	1.5	V
			$T_a=125^\circ\text{C}$		0.88		V
t_{fr}	Diode Forward Recovery Time ($di/dt=10\text{A}/\mu\text{s}$)	$I_F=0.4\text{A}$		460		ns	
		$I_F=1\text{A}$		360		ns	
		$I_F=2\text{A}$		325		ns	
$V_{CE(DSAT)}$	Dynamic Saturation Voltage	$I_C=1\text{A}, I_{B1}=100\text{mA}$ $V_{CC}=300\text{V}$ at $1\mu\text{s}$	$T_a=25^\circ\text{C}$		8		V
			$T_a=125^\circ\text{C}$		15		V
		$I_C=1\text{A}, I_{B1}=100\text{mA}$ $V_{CC}=300\text{V}$ at $3\mu\text{s}$	$T_a=25^\circ\text{C}$		2.9		V
			$T_a=125^\circ\text{C}$		8		V
		$I_C=2\text{A}, I_{B1}=400\text{mA}$ $V_{CC}=300\text{V}$ at $1\mu\text{s}$	$T_a=25^\circ\text{C}$		9		V
			$T_a=125^\circ\text{C}$		17		V
		$I_C=2\text{A}, I_{B1}=400\text{mA}$ $V_{CC}=300\text{V}$ at $3\mu\text{s}$	$T_a=25^\circ\text{C}$		1.9		V
			$T_a=125^\circ\text{C}$		8.5		V

Electrical Characteristics (Continued) $T_a=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Condition	Min	Typ.	Max.	Units	
RESISTIVE LOAD SWITCHING (D.C. $\leq 10\%$, Pulse Width=40 μs)							
t_{ON}	Turn On Time	$I_{\text{C}}=2.5\text{A}$, $I_{\text{B1}}=500\text{mA}$, $I_{\text{B2}}=-1\text{A}$, $V_{\text{CC}}=250\text{V}$, $R_{\text{L}} = 100\Omega$		500	750	ns	
t_{STG}	Storage Time		1.2		1.5	μs	
t_{F}	Fall Time			100	200	ns	
t_{ON}	Turn On Time	$I_{\text{C}}=2\text{A}$, $I_{\text{B1}}=400\text{mA}$, $I_{\text{B2}}=-1\text{A}$, $V_{\text{CC}}=300\text{V}$, $R_{\text{L}} = 150\Omega$	$T_a=25^\circ\text{C}$	100	150	ns	
			$T_a=125^\circ\text{C}$		150	ns	
t_{STG}	Storage Time		$T_a=25^\circ\text{C}$	1.4	2.2	μs	
			$T_a=125^\circ\text{C}$		1.7	μs	
t_{F}	Fall Time		$T_a=25^\circ\text{C}$		90	150	ns
			$T_a=125^\circ\text{C}$		150	ns	
t_{ON}	Turn On Time	$I_{\text{C}}=2.5\text{A}$, $I_{\text{B1}}=500\text{mA}$, $I_{\text{B2}}=-5\text{mA}$, $V_{\text{CC}}=300\text{V}$, $R_{\text{L}} = 120\Omega$	$T_a=25^\circ\text{C}$		120	150	ns
			$T_a=125^\circ\text{C}$		150	ns	
t_{STG}	Storage Time		$T_a=25^\circ\text{C}$	1.8		2.1	μs
			$T_a=125^\circ\text{C}$		2.6	μs	
t_{F}	Fall Time		$T_a=25^\circ\text{C}$		110	150	ns
			$T_a=125^\circ\text{C}$		160	ns	
INDUCTIVE LOAD SWITCHING ($V_{\text{CC}}=15\text{V}$)							
t_{STG}	Storage Time	$I_{\text{C}}=2.5\text{A}$, $I_{\text{B1}}=500\text{mA}$, $I_{\text{B2}}=-0.5\text{A}$, $V_{\text{Z}}=350\text{V}$, $L_{\text{C}}=300\mu\text{H}$	$T_a=25^\circ\text{C}$		1.9	2.2	μs
			$T_a=125^\circ\text{C}$		2.4	μs	
t_{F}	Fall Time		$T_a=25^\circ\text{C}$		160	200	ns
			$T_a=125^\circ\text{C}$		330	ns	
t_{C}	Cross-over Time		$T_a=25^\circ\text{C}$		350	500	ns
			$T_a=125^\circ\text{C}$		750	ns	
t_{STG}	Storage Time	$I_{\text{C}}=2\text{A}$, $I_{\text{B1}}=400\text{mA}$, $I_{\text{B2}}=-0.4\text{A}$, $V_{\text{Z}}=300\text{V}$, $L_{\text{C}}=200\mu\text{H}$	$T_a=25^\circ\text{C}$	1.95		2.25	μs
			$T_a=125^\circ\text{C}$		2.9	μs	
t_{F}	Fall Time		$T_a=25^\circ\text{C}$		120	150	ns
			$T_a=125^\circ\text{C}$		270	ns	
t_{C}	Cross-over Time		$T_a=25^\circ\text{C}$		300	450	ns
			$T_a=125^\circ\text{C}$		700	ns	
t_{STG}	Storage Time	$I_{\text{C}}=1\text{A}$, $I_{\text{B1}}=100\text{mA}$, $I_{\text{B2}}=-0.5\text{A}$, $V_{\text{Z}}=300\text{V}$, $L_{\text{C}}=200\mu\text{H}$	$T_a=25^\circ\text{C}$		0.6	0.8	μs
			$T_a=125^\circ\text{C}$		1.0	μs	
t_{F}	Fall Time		$T_a=25^\circ\text{C}$		70	ns	
			$T_a=125^\circ\text{C}$		110	ns	
t_{C}	Cross-over Time		$T_a=25^\circ\text{C}$		80	130	ns
			$T_a=125^\circ\text{C}$		170	ns	

Typical Characteristics

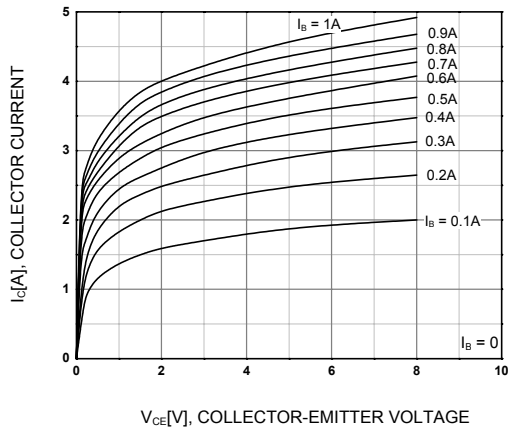


Figure 1. Static Characteristic

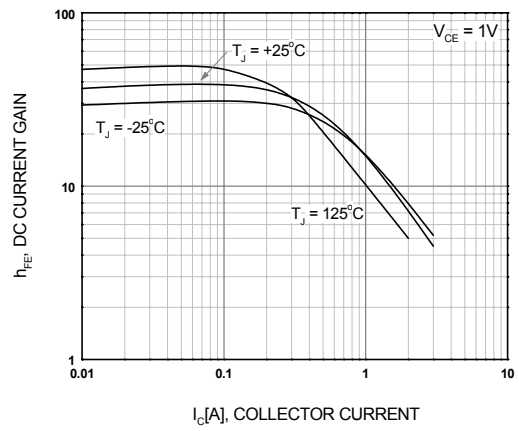


Figure 2. DC current Gain

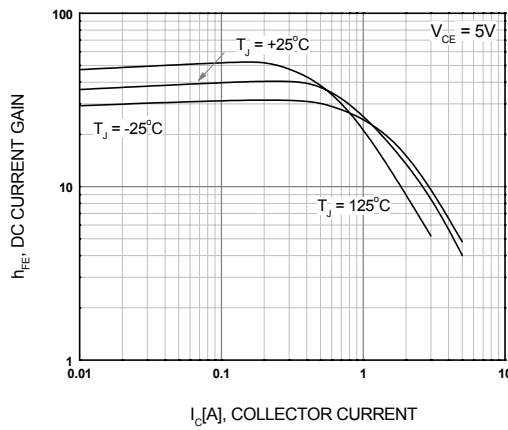


Figure 3. DC current Gain

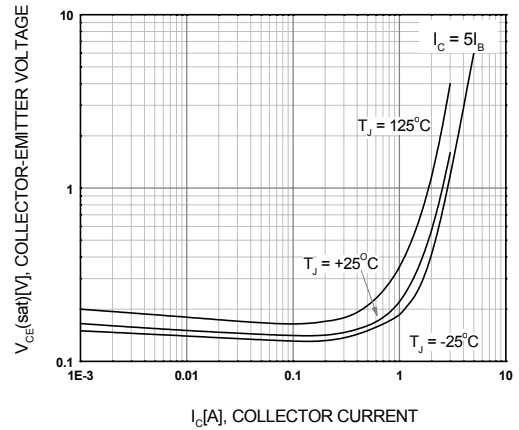


Figure 4. Collector-Emitter Saturation Voltage

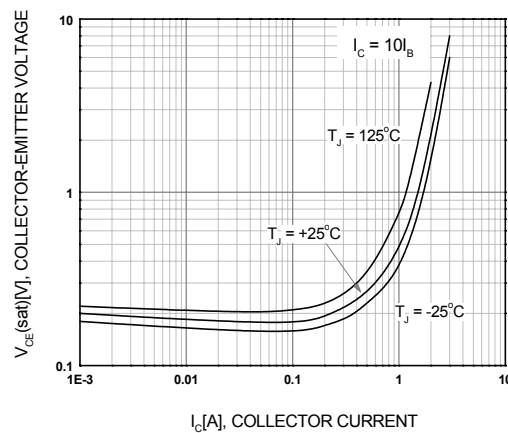


Figure 5. Collector-Emitter Saturation Voltage

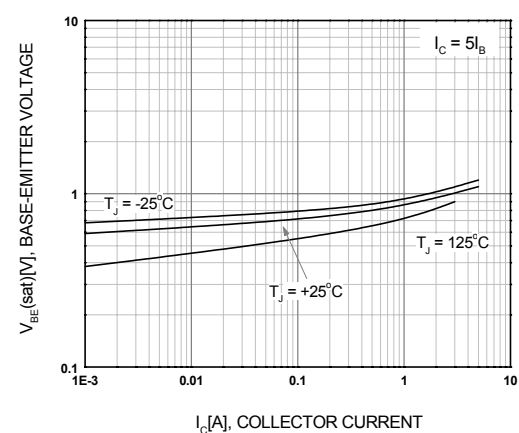


Figure 6. Base-Emitter Saturation Voltage

Typical Characteristics (Continued)

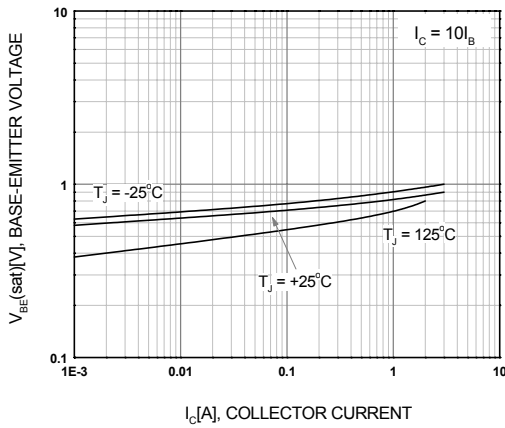


Figure 7. Base-Emitter Saturation Voltage

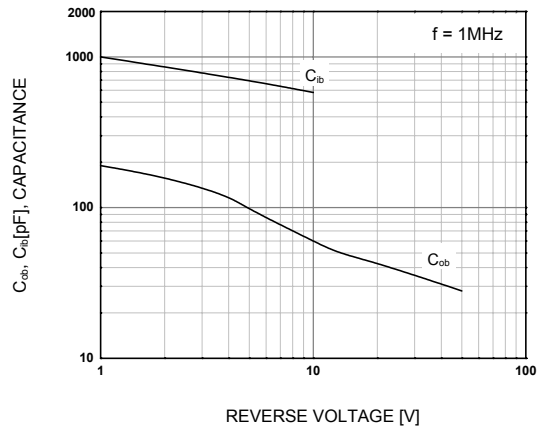


Figure 8. Collector Output Capacitance

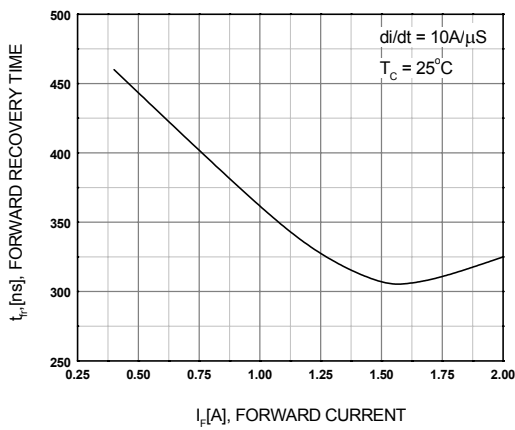


Figure 9. Forward Recovery Time

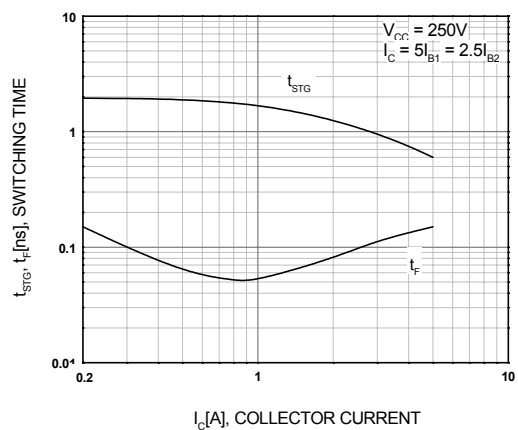


Figure 10. Switching Time

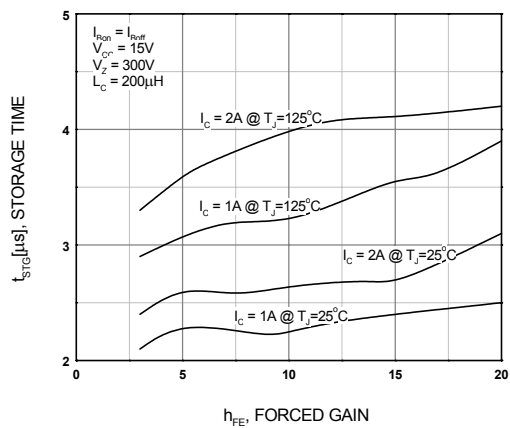


Figure 11. Induction Storage Time

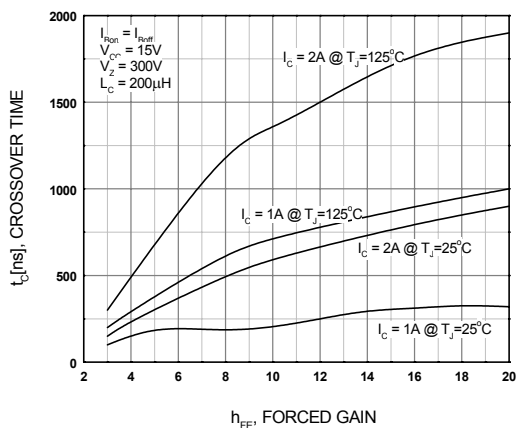


Figure 12. Inductive Crossover Time

Typical Characteristics (Continued)

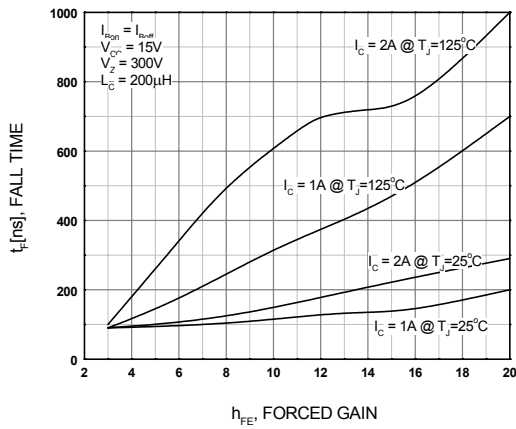


Figure 13. Inductive Fall Time

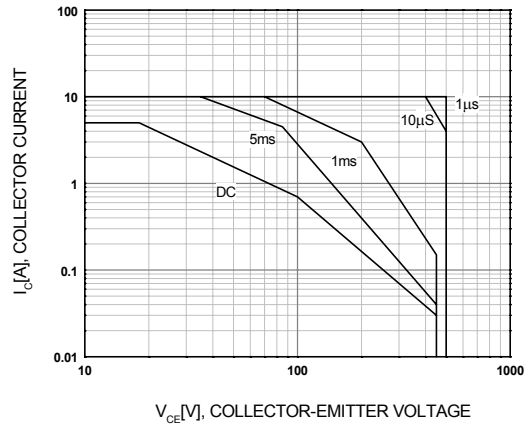


Figure 14. Safe Operating Area

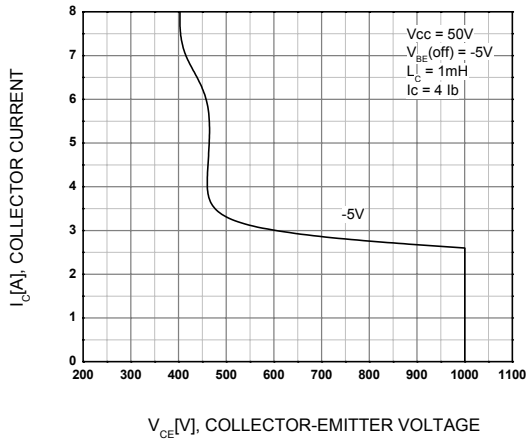


Figure 15. Reverse Bias Safe Operating

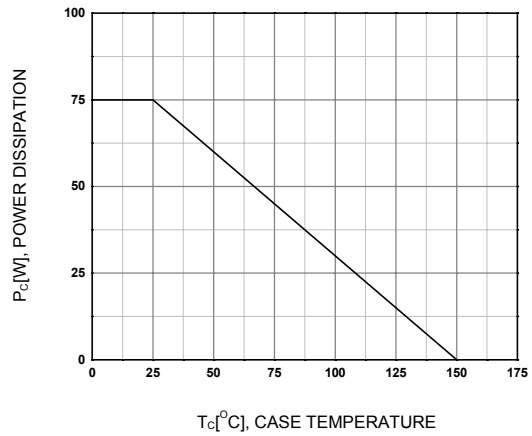


Figure 16. Power Derating

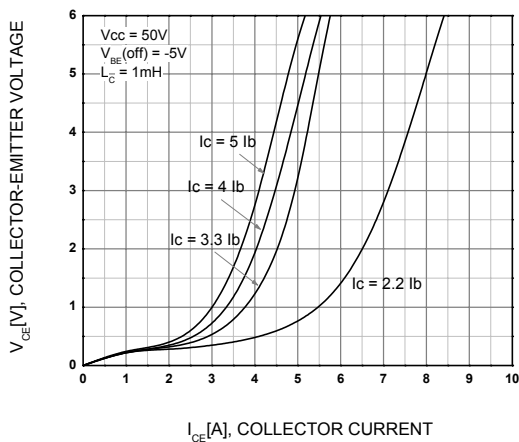
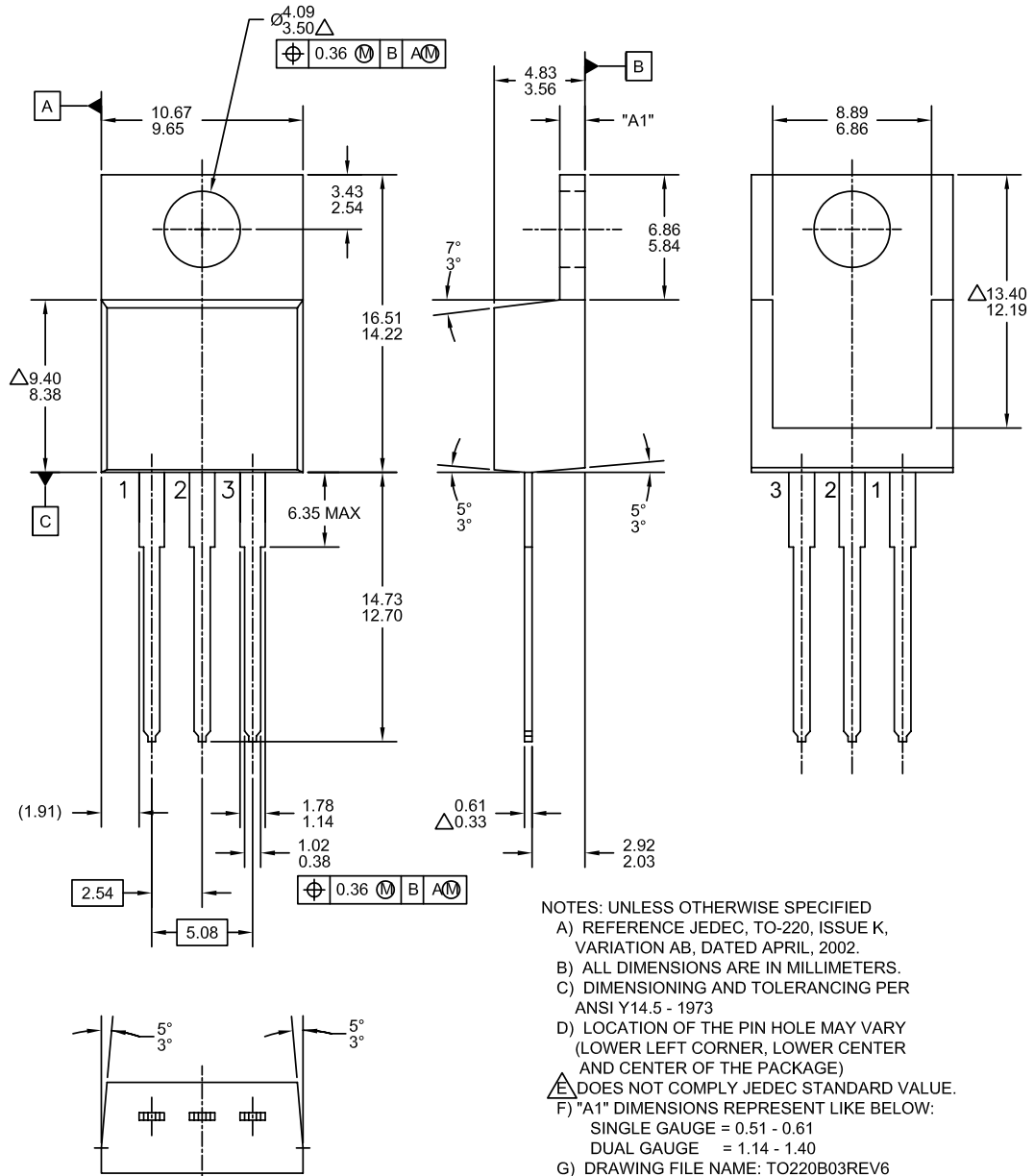


Figure 17. RBSOA Saturation

Physical Dimensions

TO-220








Dimensions in Millimeters



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