



**TO-92**



**Pin Definition:**

- 1. Emitter
- 2. Collector
- 3. Base

**PRODUCT SUMMARY**

<b><math>BV_{CEO}</math></b>	400V
<b><math>BV_{CBO}</math></b>	700V
<b><math>I_C</math></b>	1.5A
<b><math>V_{CE(SAT)}</math></b>	0.8V @ $I_C / I_B = 0.5A / 0.1A$

**Features**

- High Voltage
- High Speed Switching

**Structure**

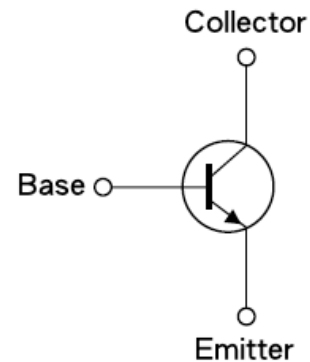
- Silicon Triple Diffused Type
- NPN Silicon Transistor

**Ordering Information**

Part No.	Package	Packing
TS13003BCT B0	TO-92	1Kpcs / Bulk
TS13003BCT B0G	TO-92	1Kpcs / Bulk
TS13003BCT A3	TO-92	2Kpcs / Ammo
TS13003BCT A3G	TO-92	2Kpcs / Ammo

Note: "G" denote for Green Product

**Block Diagram**



**Absolute Maximum Rating** ( $T_a = 25^\circ\text{C}$  unless otherwise noted)

Parameter	Symbol	Limit	Unit
Collector-Base Voltage	$V_{CBO}$	700V	V
Collector-Emitter Voltage	$V_{CEO}$	400V	V
Emitter-Base Voltage	$V_{EBO}$	9	V
Collector Current	DC	1.5	A
	Pulse	3	
Collector Power Dissipation	$P_D$	1.5	W
Operating Junction Temperature	$T_J$	+150	$^\circ\text{C}$
Operating Junction and Storage Temperature Range	$T_{STG}$	- 55 to +150	$^\circ\text{C}$

**Thermal Performance**

Parameter	Symbol	Limit	Unit
Junction to Ambient Thermal Resistance	$R_{\theta JA}$	121.4	$^\circ\text{C/W}$

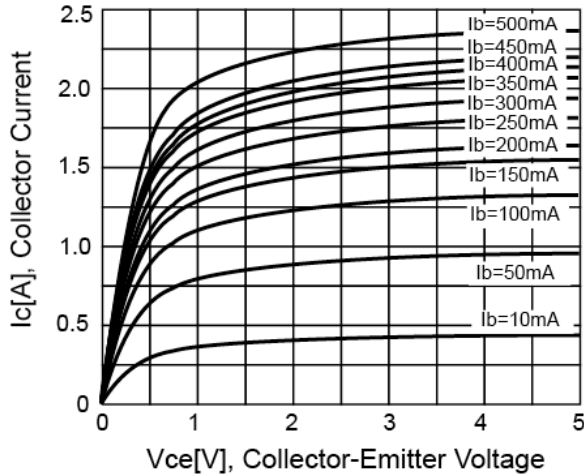
**Electrical Specifications** (Ta = 25°C unless otherwise noted)

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Collector-Base Voltage	$I_C = 1\text{mA}, I_B = 0$	$BV_{CBO}$	700	--	--	V
Collector-Emitter Breakdown Voltage	$I_C = 10\text{mA}, I_E = 0$	$BV_{CEO}$	400	--	--	V
Emitter-Base Breakdown Voltage	$I_E = 1\text{mA}, I_C = 0$	$BV_{EBO}$	9	--	--	V
Collector-Emitter Cutoff Current	$V_{CE} = 400\text{V}, I_B = 0$	$I_{CEO}$	--	--	1	uA
Collector-Emitter Cutoff Current @45°C	$V_{CE} = 400\text{V}, I_B = 0$	$I_{CEO}$	--	0.5	--	uA
Collector Cutoff Current	$V_{CB} = 700\text{V}, I_E = 0$	$I_{CBO}$	--	--	1	uA
Collector Cutoff Current @45°C	$V_{CB} = 700\text{V}, I_E = 0$	$I_{CBO}$	--	0.2	--	uA
Emitter Cutoff Current	$V_{EB} = 9\text{V}, I_C = 0$	$I_{EBO}$	--	0.1	1	uA
Collector-Emitter Saturation Voltage*	$I_C / I_B = 0.5\text{A} / 0.1\text{A}$	$V_{CE(SAT)1}$	--	0.2	0.5	V
	$I_C / I_B = 1.0\text{A} / 0.25\text{A}$	$V_{CE(SAT)2}$	--	0.3	1	
	$I_C / I_B = 1.5\text{A} / 0.5\text{A}$	$V_{CE(SAT)3}$	--	0.5	3	
Base-Emitter Saturation Voltage*	$I_C / I_B = 0.5\text{A} / 0.1\text{A}$	$V_{BE(SAT)1}$	--	--	1.1	V
	$I_C / I_B = 1.0\text{A} / 0.25\text{A}$	$V_{BE(SAT)2}$	--	--	1.3	
DC Current Gain*	$V_{CE} = 2\text{V}, I_C = 10\text{mA}$	$h_{FE1}$	6	--	40	
	$V_{CE} = 2\text{V}, I_C = 400\text{mA}$	$h_{FE2}$	23	--	40	
	$V_{CE} = 2\text{V}, I_C = 1\text{A}$	$h_{FE3}$	8	--	40	
<b>Dynamic</b>						
Frequency	$V_{CE} = 10\text{V}, I_C = 0.1\text{A}$	$f_T$	4	--	--	MHz
Output Capacitance	$V_{CB} = 10\text{V}, f = 0.1\text{MHz}$	$C_{ob}$	--	21	--	pF
<b>Resistive Load Switching Time (Ratings)</b>						
Delay Time	$V_{CC} = 125\text{V}, I_C = 1\text{A},$ $I_{B1} = I_{B2} = 0.2\text{A},$ $t_p = 25\text{uS}$ Duty Cycle $\leq 1\%$	$t_d$	--	0.05	0.2	uS
Rise Time		$t_r$	--	0.6	1	uS
Storage Time		$t_{STG}$	--	2	4	uS
Fall Time		$t_f$	--	0.2	0.7	uS

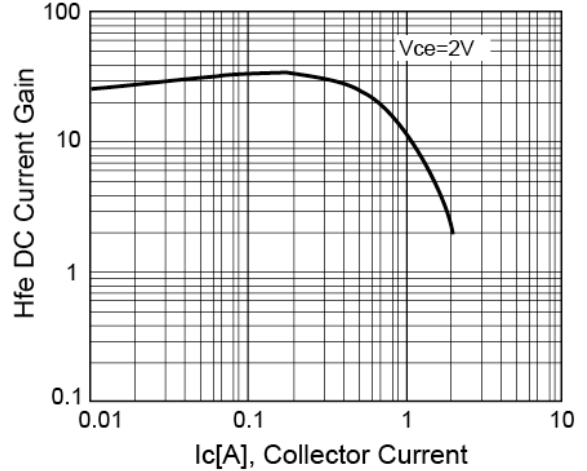
\* Note: pulse test: pulse width  $\leq 300\text{uS}$ , duty cycle  $\leq 2\%$

**Electrical Characteristics Curve** (Ta = 25°C, unless otherwise noted)

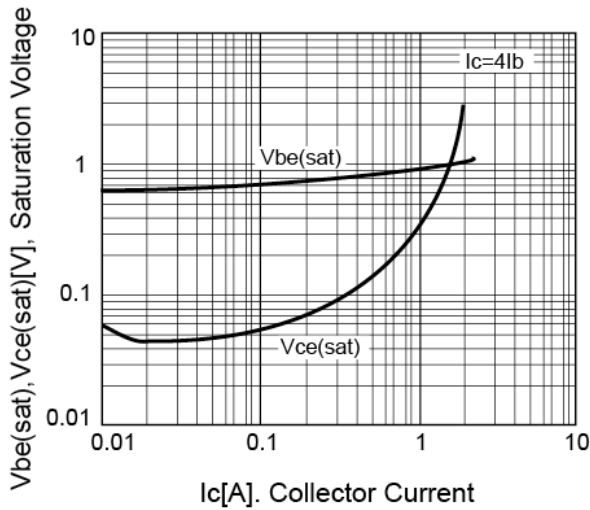
**Figure 1. Static Characteristics**



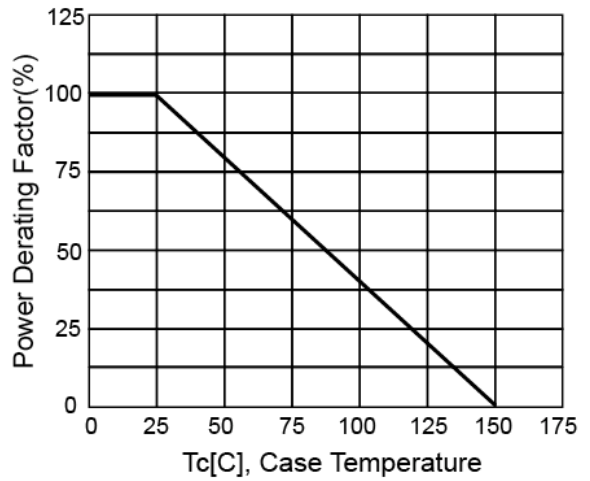
**Figure 2. DC Current Gain**



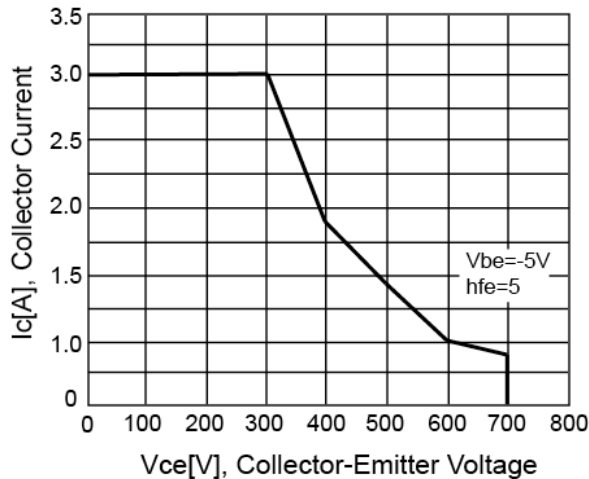
**Figure 3. VCE(SAT) V.S. VBE(SAT)**



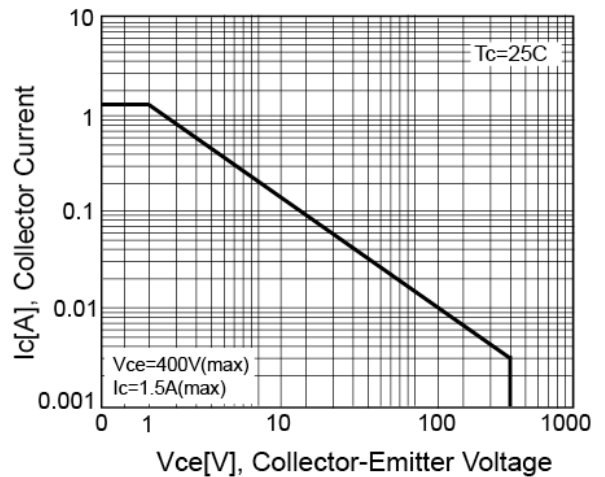
**Figure 4. Power Derating**



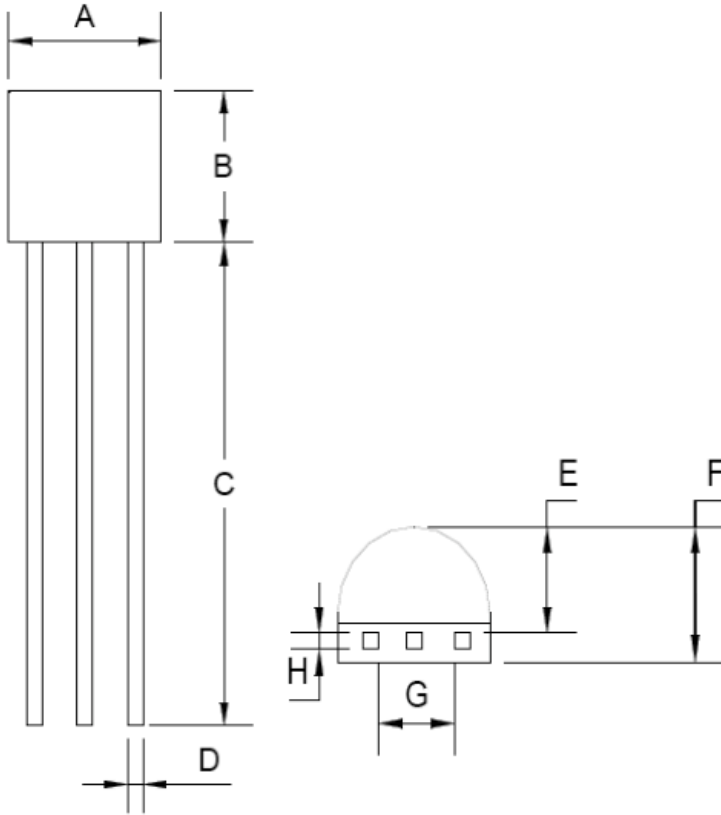
**Figure 5. Reverse Bias SOA**



**Figure 6. Safety Operating Area**

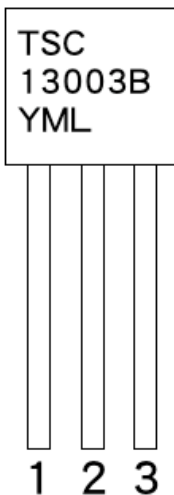


**TO-92 Mechanical Drawing**



TO-92 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.30	4.70	0.169	0.185
B	4.30	4.70	0.169	0.185
C	14.30(typ)		0.563(typ)	
D	0.43	0.49	0.017	0.019
E	2.19	2.81	0.086	0.111
F	3.30	3.70	0.130	0.146
G	2.42	2.66	0.095	0.105
H	0.37	0.43	0.015	0.017

**Marking Diagram**

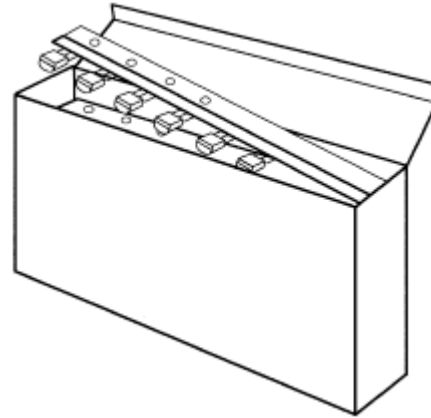
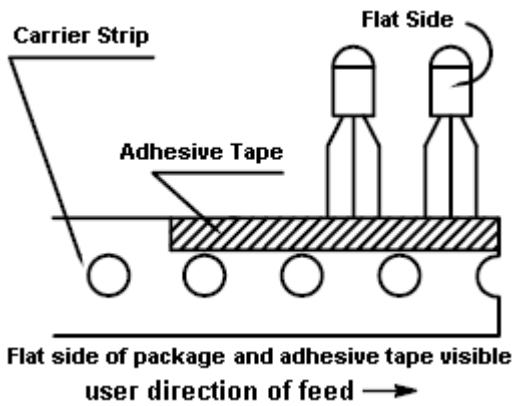


- Y** = Year Code
- M** = Month Code  
(A=Jan, B=Feb, C=Mar, D=Apl, E=May, F=Jun, G=Jul, H=Aug, I=Sep, J=Oct, K=Nov, L=Dec)
- L** = Lot Code

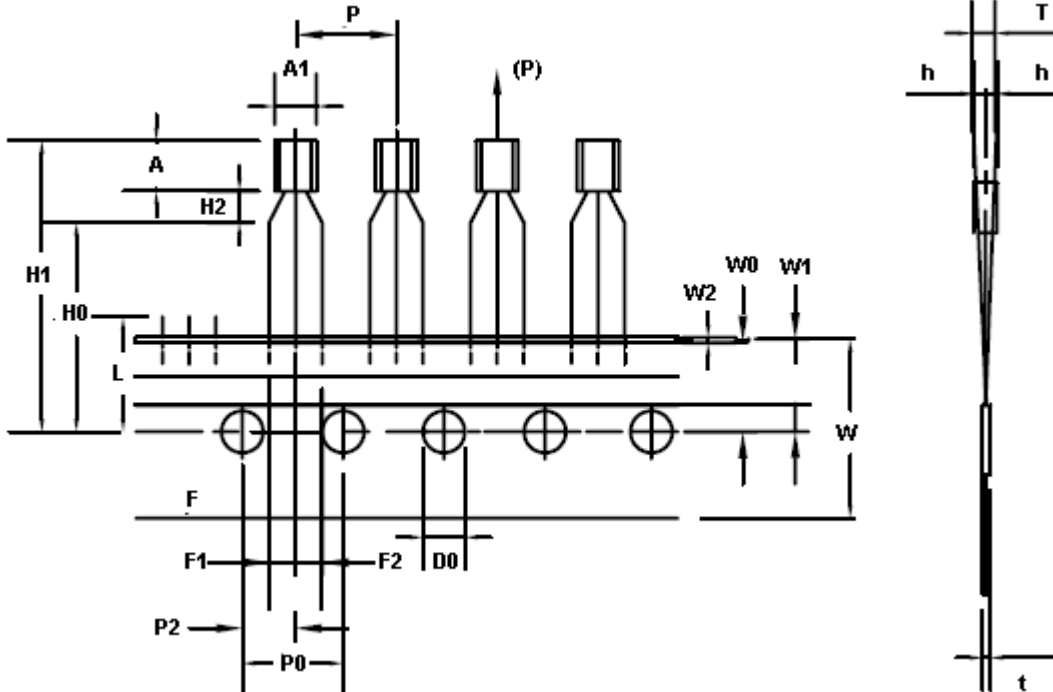
**TO-92 Ammo Pack Specification**

**Ammo Pack**

- 1.1. Ammo pack in box.
- 1.2. Qty / Box: 2,000pcs
- 1.3. Peel Strength: must be 13grams (minimum).
- 1.4. Part Orientation: Marking on flat side



**Tape Dimension**



A1	A	T	P	P0	P2	F	W	W0
4.6±0.2	4.5±0.3	3.6±0.3	12.7±1	12.7±0.3	6.25±0.4	6.02±0.6	18.0±0.5	6.0±0.2
W1	W2	H0	H1	L	D0	t	F1, F2	H2
9.0±0.7	0.5±0.2	16±0.5	23 (typ)	11	4.0±0.2	0.86±0.3	2.50±0.3	3.0 (typ)

unit: mm

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