

TO-92

Pin Definition:

1. Emitter
2. Collector
3. Base

PRODUCT SUMMARY

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

Features

- High Voltage
- High Speed Switching

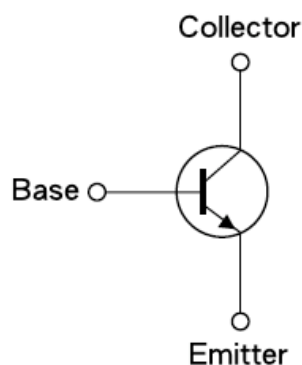
Structure

- 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	$^{\circ}\text{C/W}$
Junction to Case Thermal Resistance	$R\theta_{JC}$	36.2	$^{\circ}\text{C/W}$

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

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static						
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	$V_{CE} = 2\text{V}, I_C = 10\mu\text{A}$	h_{FE1}	20	--	--	
	$V_{CE} = 2\text{V}, I_C = 400\text{mA}$	h_{FE2}	23	--	35	
	$V_{CE} = 2\text{V}, I_C = 1\text{A}$	h_{FE3}	6	--	20	
Dynamic						
Frequency	$V_{CE} = 10\text{V}, I_C = 0.1\text{A}$	f_T	4	--	--	MHz
Output Capacitance	$V_{CB} = 10\text{V}, f = 0.1\text{MHz}$	Cob	--	21	--	pF
Resistive Load Switching Time (Ratings)						
Delay Time	$V_{CC} = 125\text{V}, I_C = 1\text{A},$ $I_{B1} = I_{B2} = 200\text{mA},$ $t_p = 25\mu\text{S}$ 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	0.4	uS

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

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

Figure 1. Static Characteristics

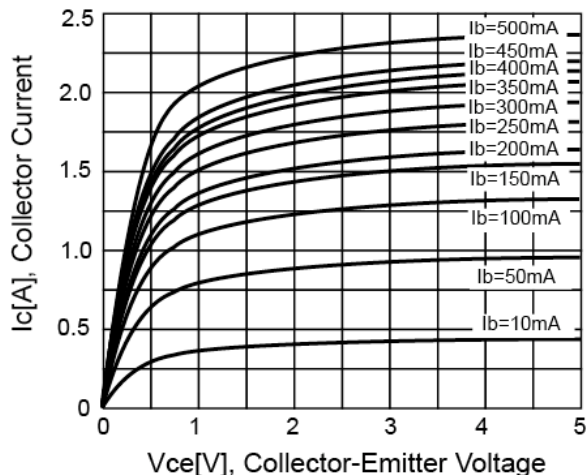


Figure 2. DC Current Gain

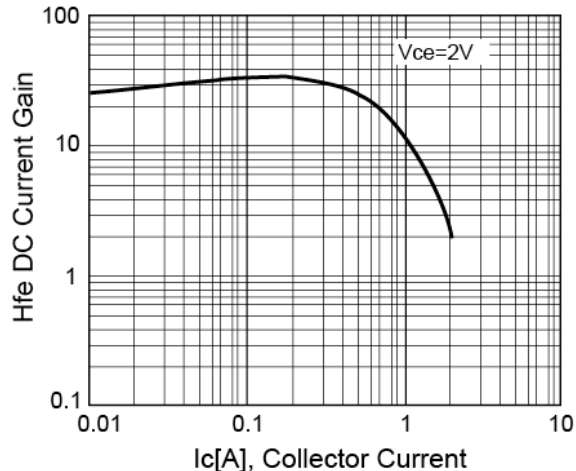


Figure 3. $V_{ce(sat)}$ v.s. $V_{be(sat)}$

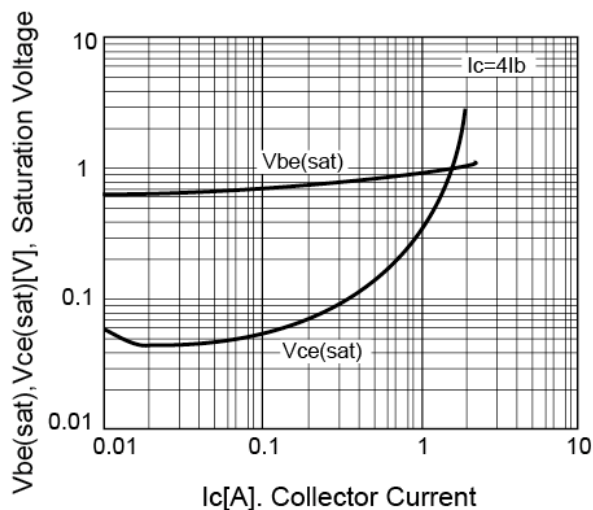


Figure 4. Power Derating

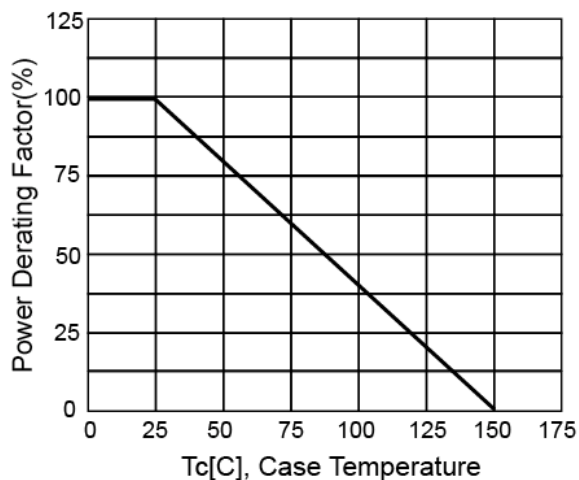


Figure 5. Reverse Bias SOA

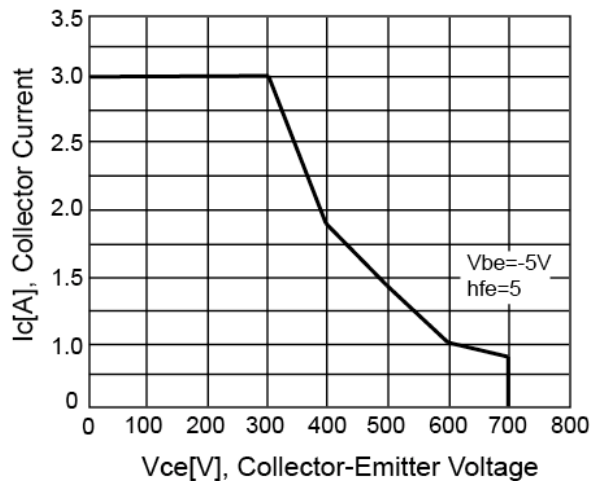
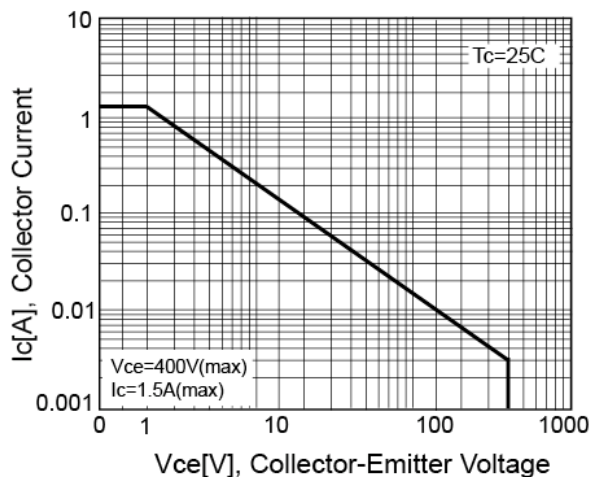
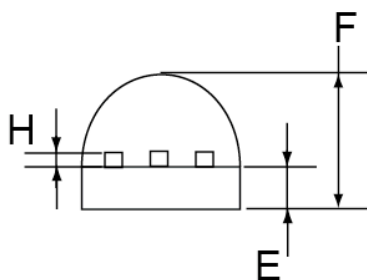
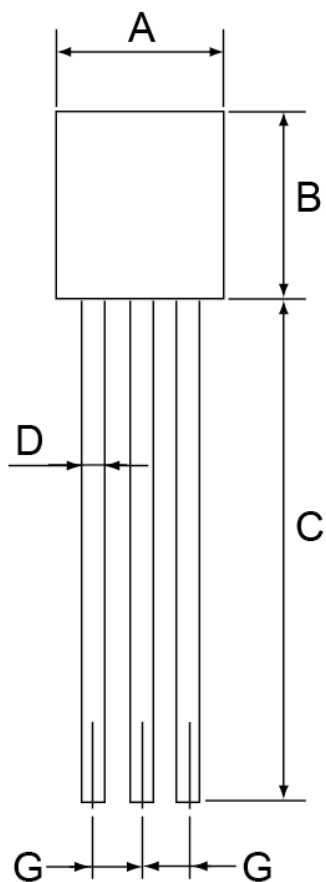


Figure 6. Safety Operating Area

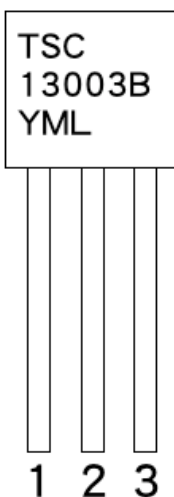


TO-92 Mechanical Drawing



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	13.53 (typ)		0.532 (typ)	
D	0.39	0.49	0.015	0.019
E	1.18	1.28	0.046	0.050
F	3.30	3.70	0.130	0.146
G	1.27	1.31	0.050	0.051
H	0.33	0.43	0.013	0.017

Marking Diagram



Y = Year Code

M = Month Code

(**A**=Jan, **B**=Feb, **C**=Mar, **D**=Apr, **E**=May, **F**=Jun, **G**=Jul, **H**=Aug, **I**=Sep, **J**=Oct, **K**=Nov, **L**=Dec)

= Month Code for Halogen Free Product

(**O**=Jan, **P**=Feb, **Q**=Mar, **R**=Apr, **S**=May, **T**=Jun, **U**=Jul, **V**=Aug, **W**=Sep, **X**=Oct, **Y**=Nov, **Z**=Dec)

L = Lot Code

TS13003B

High Voltage NPN Transistor

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