



TO-92



TO-126



**Pin Definition:**

1. Emitter
2. Collector
3. Base

**PRODUCT SUMMARY**

$BV_{CEO}$	400V
$BV_{CBO}$	700V
$I_C$	1.5A
$V_{CE(SAT)}$	1V @ $I_C = 0.5A, I_B = 0.1A$

**Features**

- High Voltage
- High Speed Switching

**Structure**

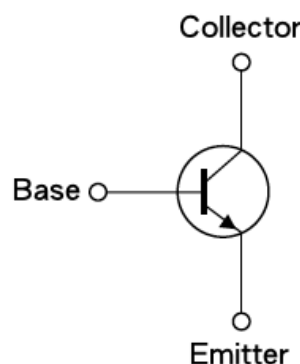
- Silicon Triple Diffused Type
- NPN Silicon Transistor

**Ordering Information**

Part No.	Package	Packing
TS13003CT B0	TO-92	1Kpcs / Bulk
TS13003CT B0G	TO-92	1Kpcs / Bulk
TS13003CT A3	TO-92	2Kpcs / Ammo
TS13003CT A3G	TO-92	2Kpcs / Ammo
TS13003CK B0	TO-126	1Kpcs / Bulk

**Note:** "G" denote for Halogen free

**Block Diagram**



**Absolute Maximum Rating** ( $T_a = 25^{\circ}C$  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	
Total Power Dissipation @ $T_c = 25^{\circ}C$	TO-92	1.5	W
	TO-126	30	
Operating Junction Temperature	$T_J$	+150	$^{\circ}C$
Operating Junction and Storage Temperature Range	$T_{STG}$	- 55 to +150	$^{\circ}C$

**Thermal Performance**

Parameter	Symbol	Limit	Unit
Junction to Ambient Thermal Resistance	TO-92	122	$^{\circ}C/W$
	TO-126	90	

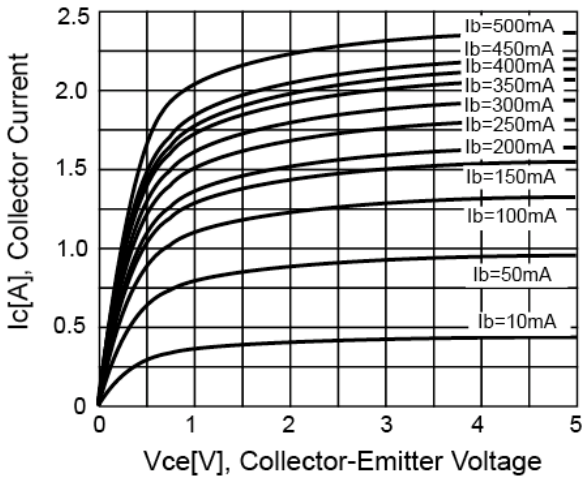
**Electrical Specifications** (Ta = 25°C unless otherwise noted)

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 Cutoff Current	$V_{CB} = 700\text{V}, I_E = 0$	$I_{CBO}$	--	--	1	uA
Emitter Cutoff Current	$V_{EB} = 9\text{V}, I_C = 0$	$I_{EBO}$	--	--	1	uA
Collector-Emitter Saturation Voltage*	$I_C / I_B = 0.5\text{A} / 0.1\text{A}$	$V_{CE(SAT)1}$	--	0.25	0.5	V
	$I_C / I_B = 1.0\text{A} / 0.25\text{A}$	$V_{CE(SAT)2}$	--	0.5	1	
	$I_C / I_B = 1.5\text{A} / 0.5\text{A}$	$V_{CE(SAT)3}$	--	1.2	3	
Base-Emitter Saturation Voltage*	$I_C / I_B = 0.5\text{A} / 0.1\text{A}$	$V_{BE(SAT)1}$	--	--	1	V
	$I_C / I_B = 1.0\text{A} / 0.25\text{A}$	$V_{BE(SAT)2}$	--	--	1.2	
DC Current Gain*	$V_{CE} = 5\text{V}, I_C = 10\text{mA}$	$h_{FE}$	6	--	40	
	$V_{CE} = 10\text{V}, I_C = 400\text{mA}$		20	--	40	
	$V_{CE} = 2\text{V}, I_C = 1\text{A}$		6	--	35	
<b>Dynamic Characteristics</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		$t_r$	--	0.5	1	uS
Storage Time		$t_{STG}$	--	2	4	uS
Fall Time		$t_f$	--	0.4	0.7	uS

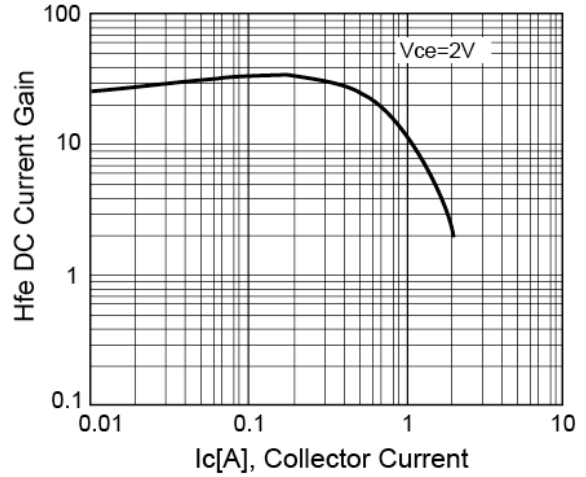
\* **Note:** pulse test: pulse width  $\leq 300\text{uS}$ , duty cycle  $\leq 2\%$

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

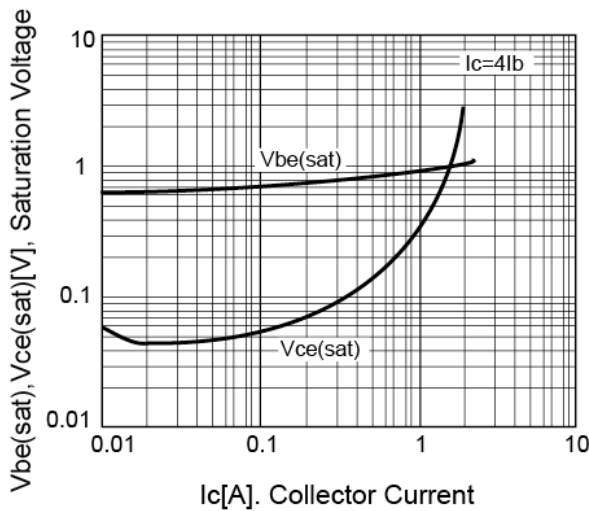
**Figure 1. Static Characteristics**



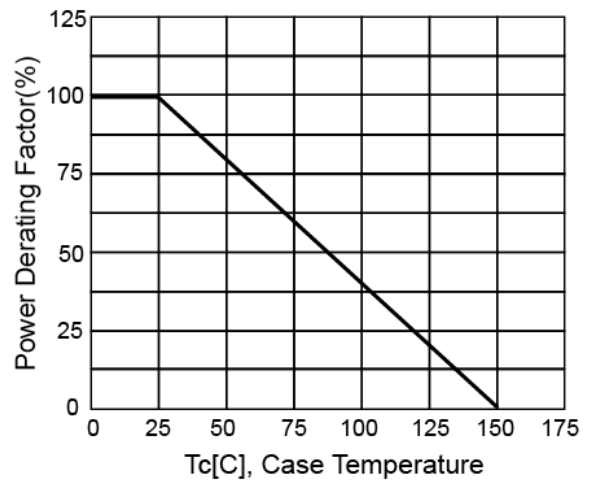
**Figure 2. DC Current Gain**



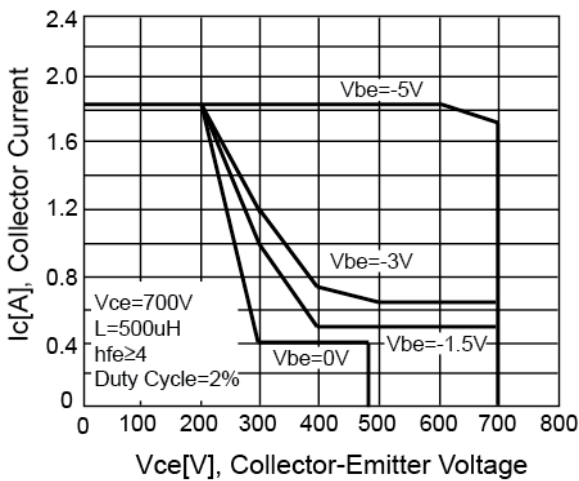
**Figure 3.  $V_{CE(SAT)}$  V.S.  $V_{BE(SAT)}$**



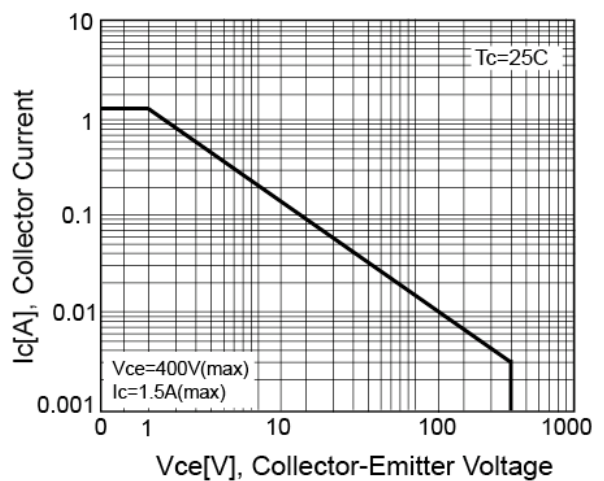
**Figure 4. Power Derating**



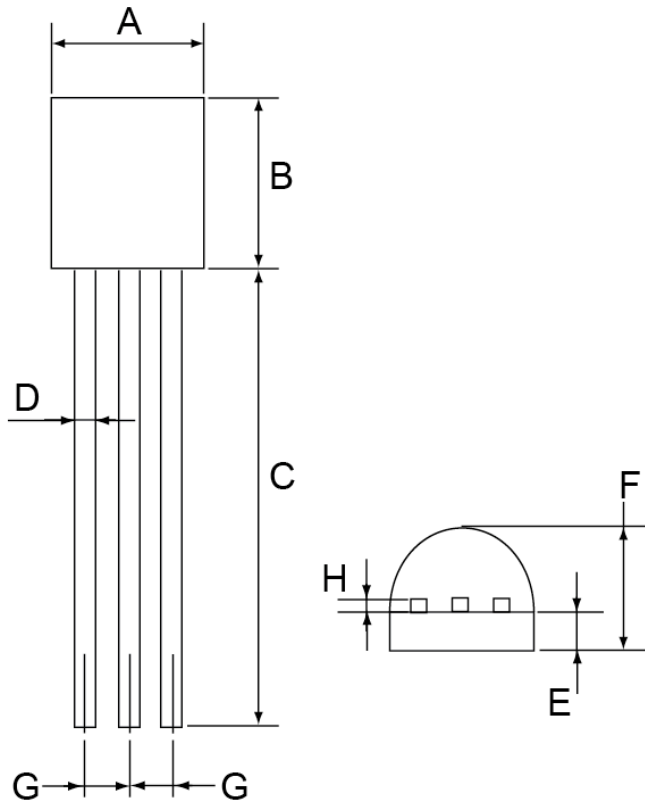
**Figure 5. Reverse Bias SOA**



**Figure 6. Safety Operating Area**

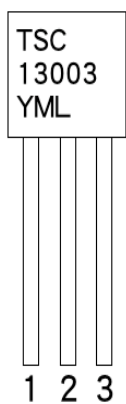


**TO-92 Mechanical Drawing**



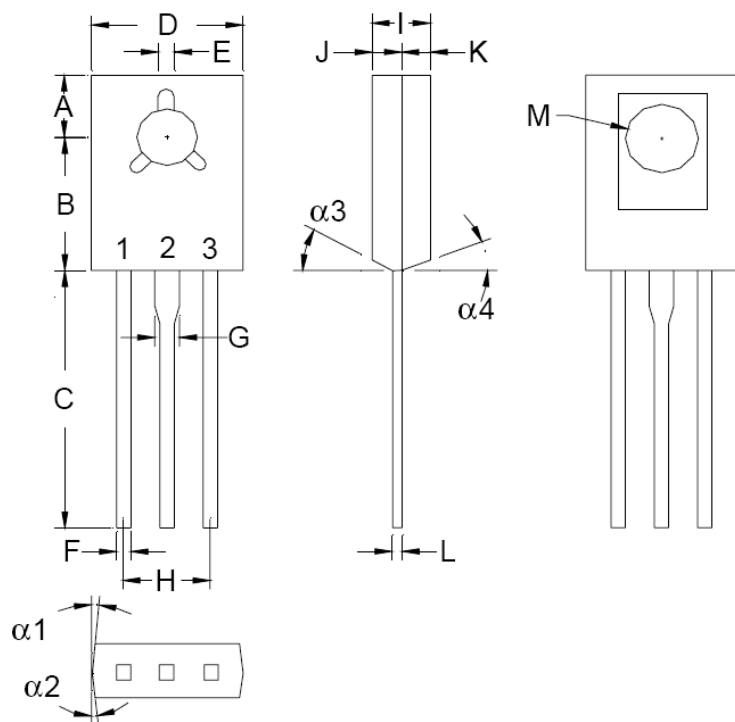
TO-92 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.30	4.70	0.169	0.185
B	4.30	4.70	0.169	0.185
C	13.53 (typ)		0.532 (typ)	
D	0.39	0.49	0.015	0.019
E	1.18	1.28	0.046	0.050
F	3.30	3.70	0.130	0.146
G	1.27	1.31	0.050	0.051
H	0.33	0.43	0.013	0.017

**Marking Diagram**



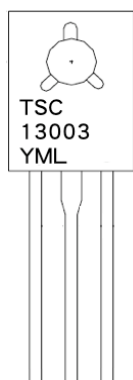
- Y** = Year Code
- M** = Month Code  
 (A=Jan, B=Feb, C=Mar, D=Apl, E=May, F=Jun, G=Jul, H=Aug, I=Sep, J=Oct, K=Nov, L=Dec)
- = Month Code for Halogen Free Product  
 (O=Jan, P=Feb, Q=Mar, R=Apl, S=May, T=Jun, U=Jul, V=Aug, W=Sep, X=Oct, Y=Nov, Z=Dec)
- L** = Lot Code

**TO-18 Mechanical Drawing**



TO-18 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
$\infty 1$	--	3°C	--	3°C
$\infty 2$	--	3°C	--	3°C
$\infty 3$	--	3°C	--	3°C
$\infty 4$	--	3°C	--	3°C
A	0.150	0.153	3.81	3.91
B	0.275	0.279	6.99	7.09
C	0.531	0.610	13.50	15.50
D	0.285	0.303	7.52	7.72
E	0.034	0.041	0.95	1.05
F	0.028	0.031	0.71	0.81
G	0.048	0.052	1.22	1.32
H	0.170	0.189	4.34	4.80
I	0.095	0.105	2.41	2.66
J	0.045	0.055	1.14	1.39
K	0.045	0.055	1.14	1.39
L	--	0.021	--	0.55
M	0.137	0.152	3.50	3.86

**Marking Diagram**



- Y** = Year Code
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- L** = Lot Code

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