



TO-92



Pin Definition:

1. Emitter
2. Collector
3. Base

TS13002A

High Voltage NPN Transistor

PRODUCT SUMMARY

BV_{CEO}	400V
BV_{CBO}	700V
I_C	0.3A
$V_{CE(SAT)}$	1.5V @ $I_C / I_B = 200mA / 20mA$

Features

- High Voltage
- High Speed Switching

Structure

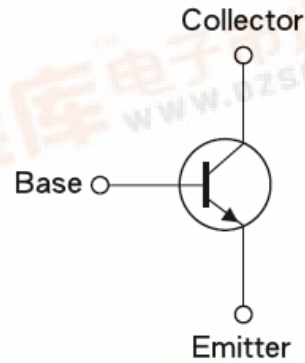
- Silicon Triple Diffused Type
- NPN Silicon Transistor

Ordering Information

Part No.	Package	Packing
TS13002ACT B0	TO-92	1Kpcs / Bulk
TS13002ACT B0G	TO-92	1Kpcs / Bulk
TS13002ACT A3	TO-92	2Kpcs / Ammo
TS13002ACT A3G	TO-92	2Kpcs / Ammo

Note: "G" denote for Green Product

Block Diagram



Absolute Maximum Rating (Ta = 25°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	0.3	A
	Pulse	0.5	
Collector Power Dissipation	P_D	0.6	W
Operating Junction Temperature	T_J	+150	°C
Operating Junction and Storage Temperature Range	T_{STG}	- 55 to +150	°C

Thermal Performance

Parameter	Symbol	Limit	Unit
Junction to Ambient Thermal Resistance	$R\theta_{JA}$	122	°C/W



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Electrical Specifications (Ta = 25°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 Cutoff Current	$V_{CB} = 700\text{V}, I_E = 0$	I_{CBO}	--	--	1	uA
Emitter Cutoff Current	$V_{EB} = 7\text{V}, I_C = 0$	I_{EBO}	--	--	1	uA
Collector-Emitter Saturation Voltage	$I_C / I_B = 50\text{mA} / 10\text{mA}$	$V_{CE(SAT)1}$	--	0.2	0.4	V
	$I_C / I_B = 100\text{mA} / 10\text{mA}$	$V_{CE(SAT)2}$	--	0.45	1	
	$I_C / I_B = 200\text{mA} / 20\text{mA}$	$V_{CE(SAT)3}$	--	1	1.5	
Base-Emitter Saturation Voltage	$I_C / I_B = 50\text{mA} / 10\text{mA}$	$V_{BE(SAT)1}$	--	--	1	V
	$I_C / I_B = 100\text{mA} / 10\text{mA}$	$V_{BE(SAT)2}$	--	--	1.2	
DC Current Gain	$V_{CE} = 10\text{V}, I_C = 10\text{mA}$	h_{FE1}	15	--	40	
	$V_{CE} = 10\text{V}, I_C = 100\text{mA}$	h_{FE2}	25	--	40	
	$V_{CE} = 10\text{V}, I_C = 280\text{mA}$	h_{FE3}	12	--	24	
Dynamic						
Frequency	$V_{CE} = 10\text{V}, I_C = 0.1\text{A}$	f_T	4	--	--	MHz
Output Capacitance	$V_{CB} = 10\text{V}, f = 0.1\text{MHz}$	C_{ob}	--	21	--	pF
Resistive Load Switching Time (Ratings)						
Rise Time	$V_{CC} = 125\text{V}, I_C = 100\text{mA},$ $I_{B1} = I_{B2} = 20\text{mA},$ $t_p = 25\text{uS}$ Duty Cycle $\leq 1\%$	t_r	--	1.1	--	uS
Storage Time		t_{STG}	--	2	4	uS
Fall Time		t_f	--	0.2	0.7	uS

Note : pulse test: pulse width $\leq 5\text{ms}$, duty cycle $\leq 10\%$

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

Figure 1. Static Characteristics

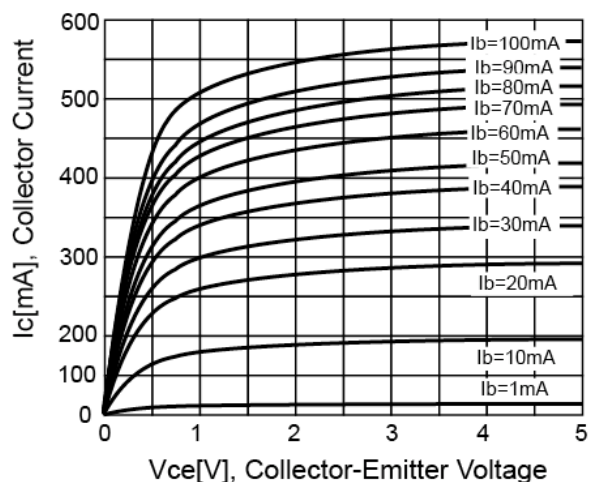


Figure 2. DC Current Gain

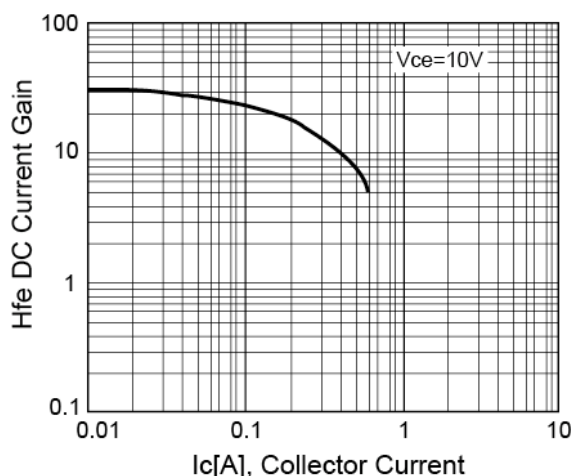


Figure 3. $V_{ce(sat)}$ v.s. $V_{be(sat)}$

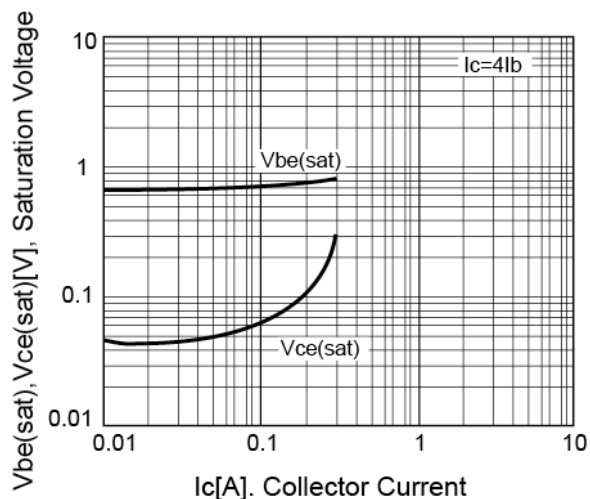


Figure 4. Power Derating

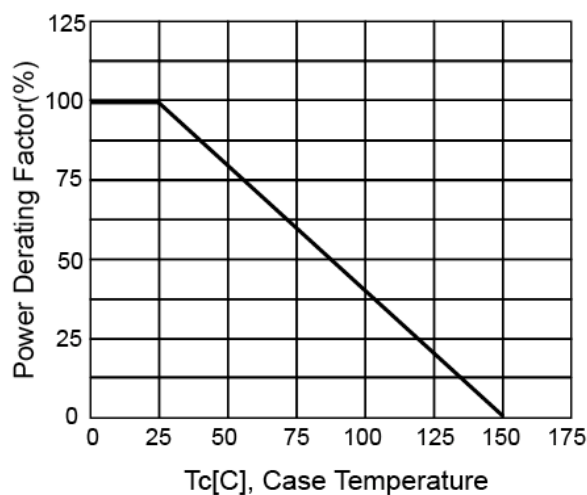


Figure 5. Reverse Bias SOA

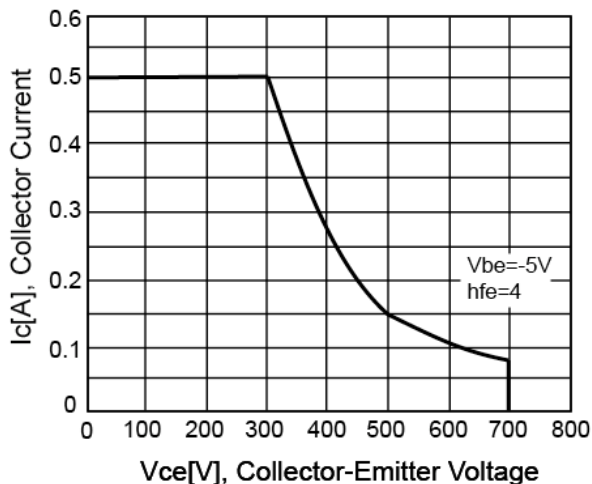
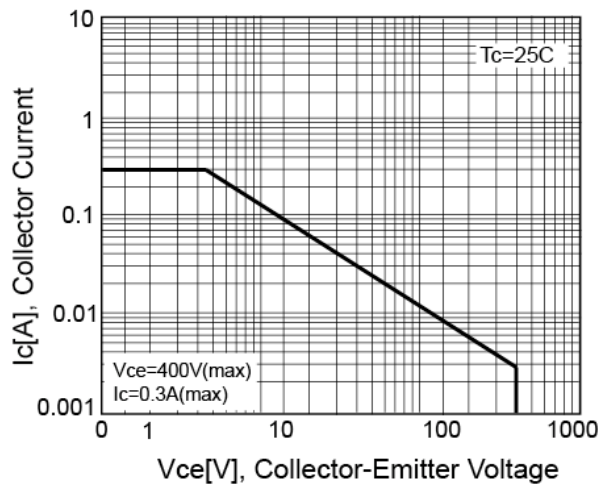


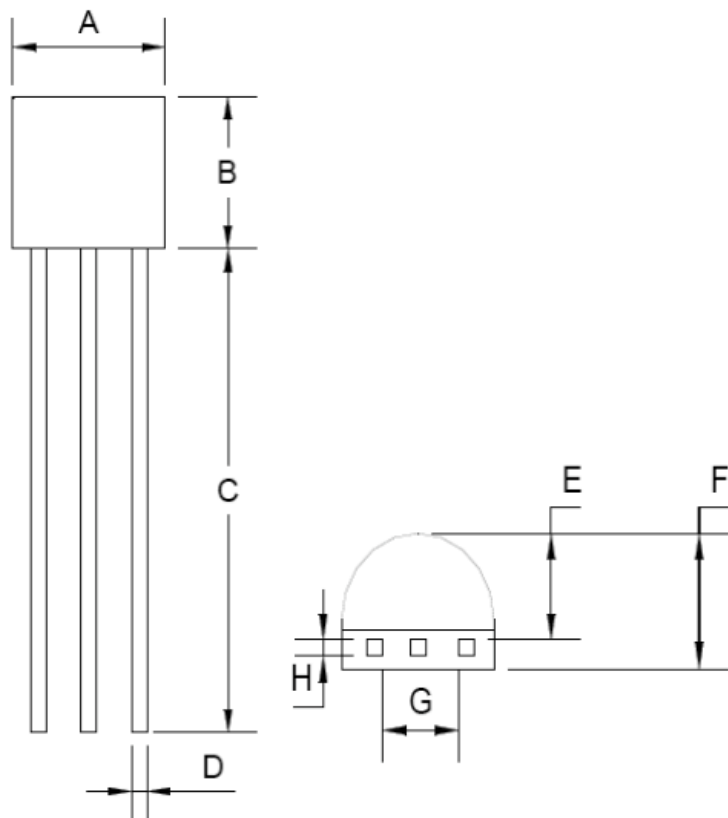
Figure 6. Safety Operating Area



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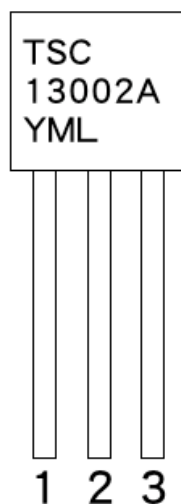
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TO-92 Mechanical Drawing



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**=Apr, **E**=May, **F**=Jun, **G**=Jul, **H**=Aug, **I**=Sep, **J**=Oct, **K**=Nov, **L**=Dec)

L = Lot Code



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