TAIWAN SEMICONDUCTOR

RoHS COMPLIANCE

TS13002A

High Voltage NPN Transistor

TO-92



Pin Definition:
1. Emitter
2. Collector
3. Base

PRODUCT SUMMARY

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

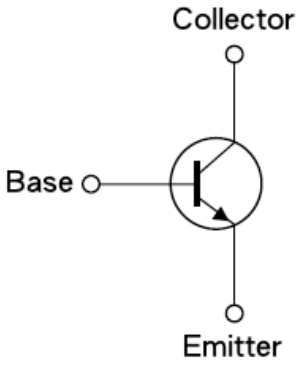
Features

- High Voltage
- High Speed Switching

Structure

- Silicon Triple Diffused Type
- NPN Silicon Transistor

Block Diagram



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

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	I_C	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 = 1mA, I_B = 0	BV_{CBO}	700	--	--	V
Collector-Emitter Breakdown Voltage	I_C = 10mA, I_E = 0	BV_{CEO}	400	--	--	V
Emitter-Base Breakdown Voltage	I_E = 1mA, I_C = 0	BV_{EBO}	9	--	--	V
Collector Cutoff Current	V_{CB} = 700V, I_E = 0	I_{CBO}	--	--	1	uA
Emitter Cutoff Current	V_{EB} = 7V, I_C = 0	I_{EBO}	--	--	1	uA
Collector-Emitter Saturation Voltage	I_C / I_B = 50mA / 10mA	$V_{CE(SAT)1}$	--	0.2	0.4	V
	I_C / I_B = 100mA / 10mA	$V_{CE(SAT)2}$	--	0.45	1	
	I_C / I_B = 200mA / 20mA	$V_{CE(SAT)3}$	--	1	1.5	
Base-Emitter Saturation Voltage	I_C / I_B = 50mA / 10mA	$V_{BE(SAT)1}$	--	--	1	V
	I_C / I_B = 100mA / 10mA	$V_{BE(SAT)2}$	--	--	1.2	
DC Current Gain	V_{CE} = 10V, I_C = 10mA	$h_{FE}1$	15	--	40	
	V_{CE} = 10V, I_C = 100mA	$h_{FE}2$	25	--	40	
	V_{CE} = 10V, I_C = 280mA	$h_{FE}3$	12	--	24	
Dynamic						
Frequency	V_{CE} = 10V, I_C = 0.1A	f_T	4	--	--	MHz
Output Capacitance	V_{CB} = 10V, f = 0.1MHz	Cob	--	21	--	pF
Resistive Load Switching Time (Ratings)						
Rise Time	V_{CC} = 125V, I_C = 100mA, I_{B1} = I_{B2} = 20mA, t_p = 25uS Duty Cycle ≤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 ≤5mS, duty cycle ≤10%

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

Figure 1. Static Characteristics

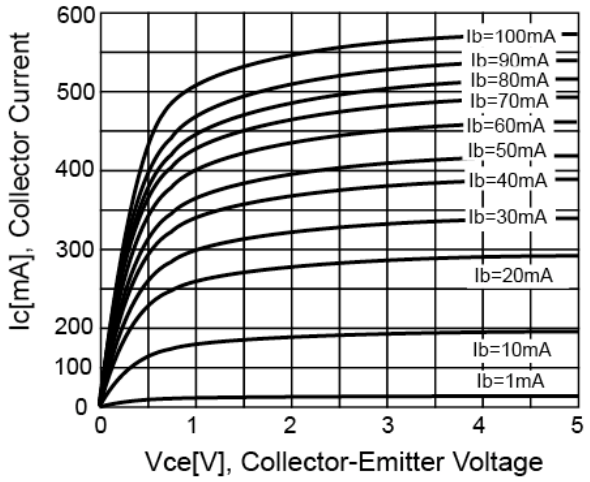


Figure 2. DC Current Gain

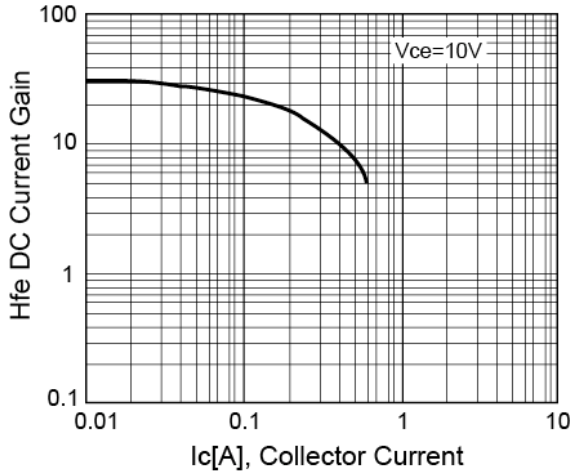


Figure 3. $V_{CE(SAT)}$ v.s. $V_{BE(SAT}$

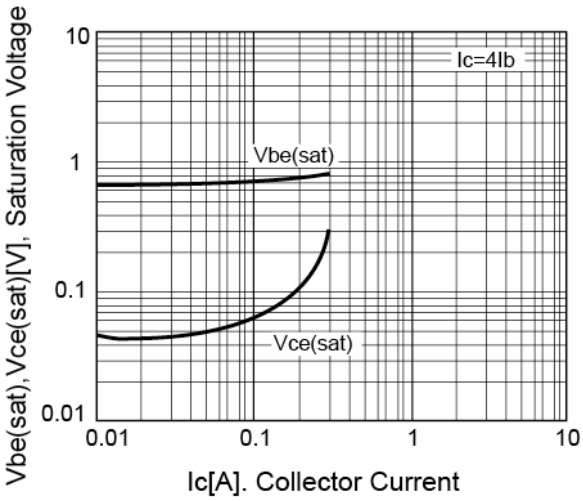


Figure 4. Power Derating

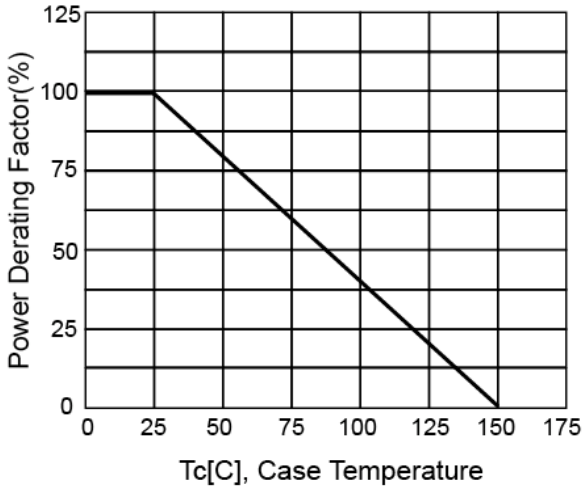


Figure 5. Reverse Bias SOA

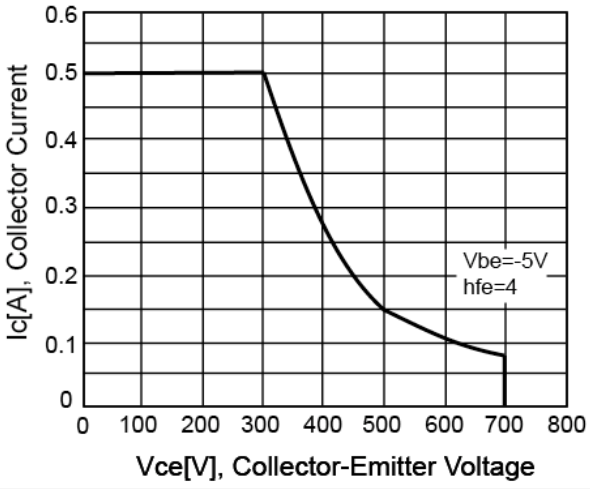
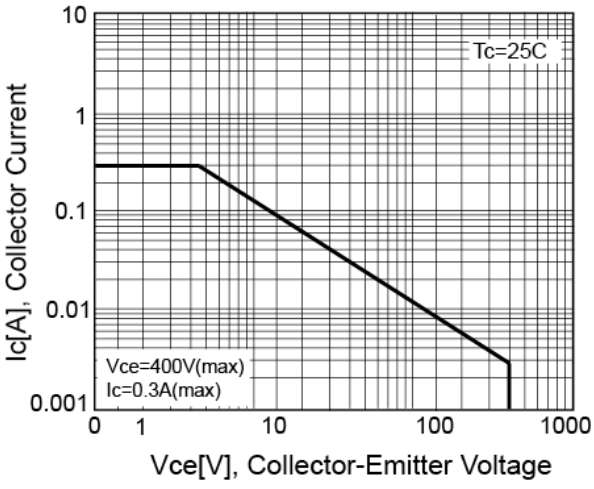
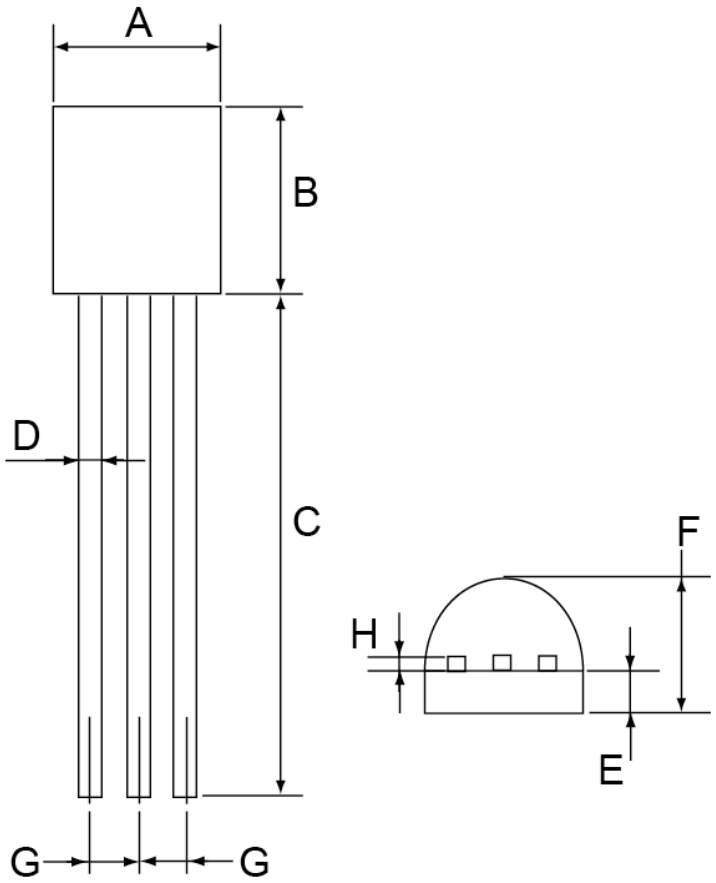


Figure 6. Safety Operating Area



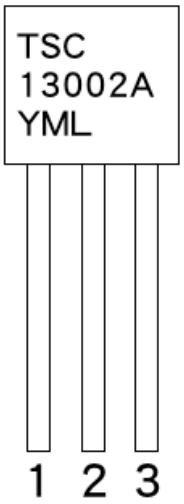
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TO-92 Mechanical Drawing



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

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