TAIWAN SEMICONDUCTOR

RoHS COMPLIANCE

TS13003

High Voltage NPN Transistor

TO-92



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

TO-126



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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

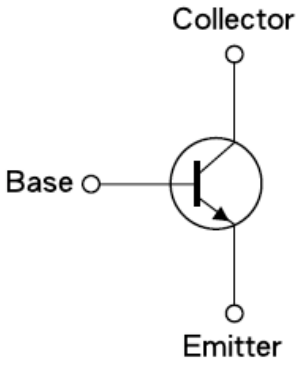
Features

- High Voltage
- High Speed Switching

Structure

- Silicon Triple Diffused Type
- NPN Silicon Transistor

Block Diagram



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 Sb Free

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	1.5	A
	Pulse		3	
Total Power Dissipation @ Tc= 25°C	TO-92	P_{tot}	1.5	W
	TO-126		30	
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	TO-92	$R\Theta_{JA}$	122	°C/W
	TO-126		90	

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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} = 9V, I_C = 0	I_{EBO}	--	--	1	uA
Collector-Emitter Saturation Voltage*	I_C / I_B = 0.5A / 0.1A	$V_{CE(SAT)1}$	--	0.25	0.5	V
	I_C / I_B = 1.0A / 0.25A	$V_{CE(SAT)2}$	--	0.5	1	
	I_C / I_B = 1.5A / 0.5A	$V_{CE(SAT)3}$	--	1.2	3	
Base-Emitter Saturation Voltage*	I_C / I_B = 0.5A / 0.1A	$V_{BE(SAT)1}$	--	--	1	V
	I_C / I_B = 1.0A / 0.25A	$V_{BE(SAT)2}$	--	--	1.2	
DC Current Gain*	V_{CE} = 5V, I_C = 10mA	h_{FE}	6	--	40	
	V_{CE} = 10V, I_C = 400mA		20	--	40	
	V_{CE} = 2V, I_C = 1A		8	--	40	
Dynamic Characteristics						
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)						
Delay Time	V_{CC} = 125V, I_C = 1A, I_{B1} = I_{B2} = 0.2A, t_p = 25uS Duty Cycle ≤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 ≤300uS, duty cycle ≤2%

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

Figure 1. Static Characteristics

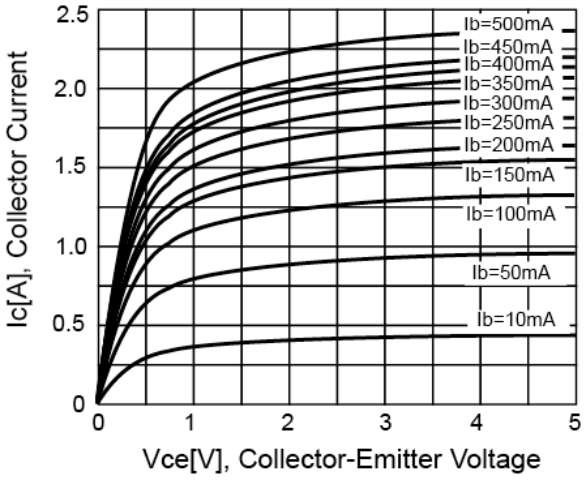


Figure 2. DC Current Gain

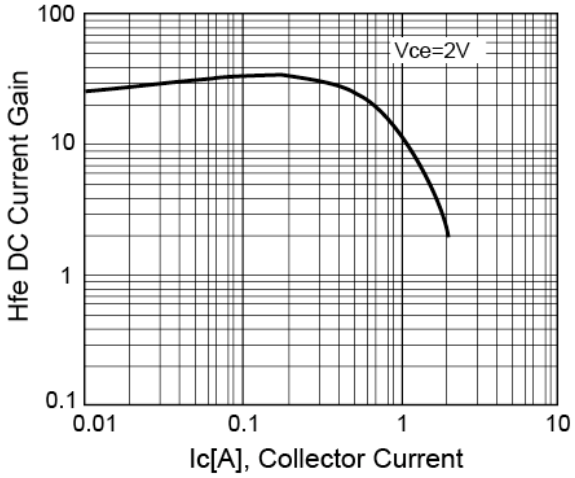


Figure 3. $V_{CE(SAT)}$ v.s. $V_{BE(SAT}$

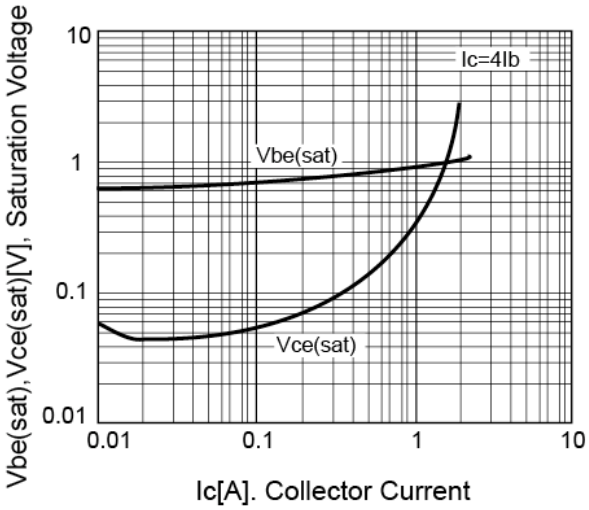


Figure 4. Power Derating

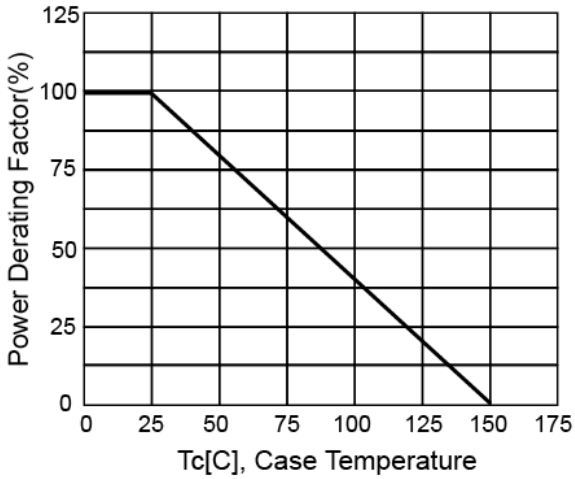


Figure 5. Reverse Bias SOA

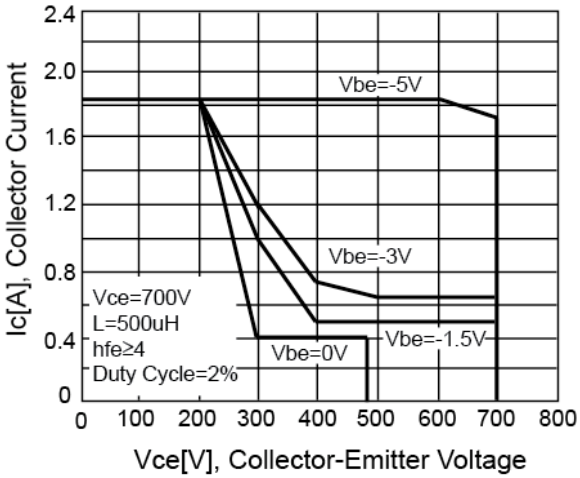
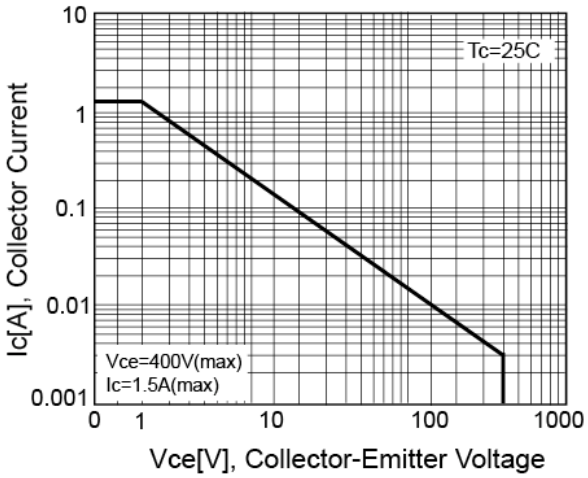


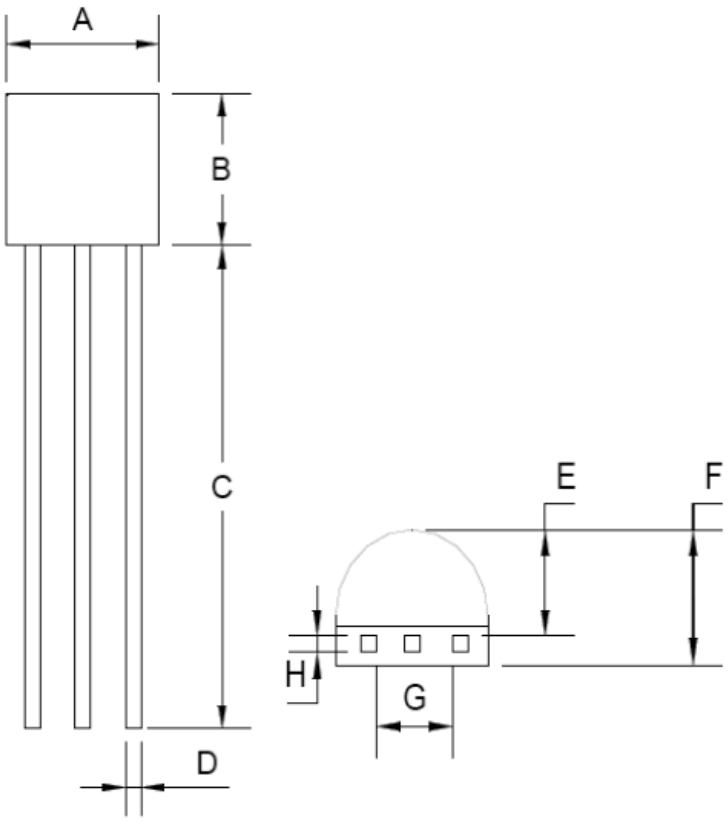
Figure 6. Safety Operating Area



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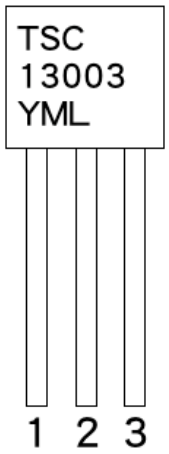
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TO-92 Mechanical Drawing



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

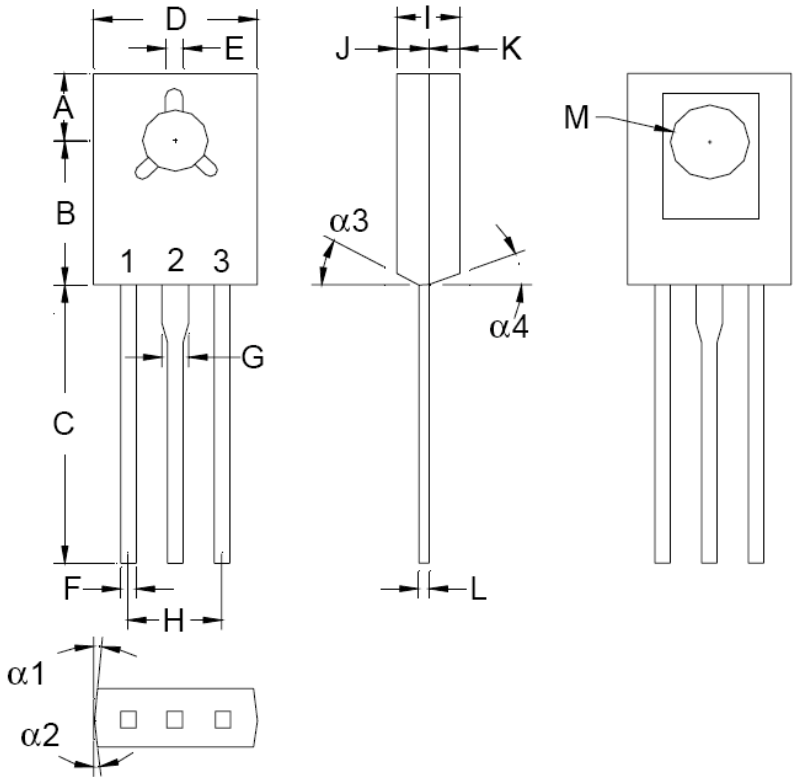


Y = Year Code
M = Month Code
(**A**=Jan, **B**=Feb, **C**=Mar, **D**=Apl, **E**=May, **F**=Jun, **G**=Jul, **H**=Aug, **I**=Sep, **J**=Oct, **K**=Nov, **L**=Dec)
L = Lot Code

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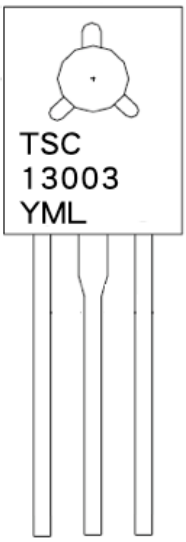
High Voltage NPN Transistor

TO-126 Mechanical Drawing



TO-126 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
∝1	--	3ºC	--	3ºC
∝2	--	3ºC	--	3ºC
∝3	--	3ºC	--	3ºC
∝4	--	3ºC	--	3ºC
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



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L = Lot Code

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