

TO-92



Pin Definition:

1. Emitter
2. Collector
3. Base

PRODUCT SUMMARY

BV_{CEO}	400V
BV_{CBO}	800V
I_C	1.5A
$V_{CE(SAT)}$	0.8V @ $I_C / I_B = 1A / 0.25A$

Features

- High Voltage
- High Speed Switching

Structure

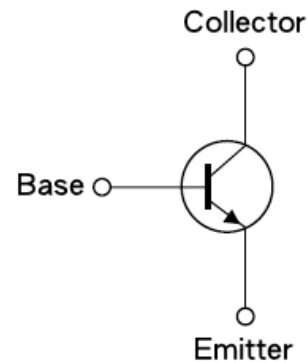
- Silicon Triple Diffused Type
- NPN Silicon Transistor

Ordering Information

Part No.	Package	Packing
TS13003MVCT B0	TO-92	1Kpcs / Bulk
TS13003MVCT A3	TO-92	2Kpcs / Ammo
TS13003MVCT B0G	TO-92	1Kpcs / Bulk
TS13003MVCT A3G	TO-92	2Kpcs / Ammo

Note: "G" is denote Halogen Free Product.

Block Diagram



Absolute Maximum Rating (Ta = 25°C unless otherwise noted)

Parameter	Symbol	Limit	Unit
Collector-Base Voltage	V_{CBO}	800	V
Collector-Emitter Voltage ($V_{BE}=0$)	V_{CES}	800	V
Collector-Emitter Voltage	V_{CEO}	400	V
Emitter-Base Voltage	V_{EBO}	9	V
Collector Current	DC	1.5	A
	Pulse	3	
Total Power Dissipation $T_c=25^\circ\text{C}$	P_D	5.8	W
Operating Junction Temperature	T_J	+150	°C
Operating Junction and Storage Temperature Range	T_{STG}	- 55 to +150	°C
Thermal Resistance Junction to Case	$R_{\theta JC}$	21.5	°C/W

Electrical Specifications (T_c = 25°C unless otherwise noted)

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static						
Collector-Base Voltage	I _C = 1mA, I _E = 0, t=300uS	BV _{CBO}	800	--	--	V
	I _C = 1mA, I _E = 0, T _C =125°C, t=2uS		830	--	--	
Collector-Emitter Sustaining Voltage	I _C = 1mA, I _B = 0, t=300uS	BV _{CES}	830	--	--	V
	I _C = 1mA, I _B = 0, T _C =125°C, t=2uS		830	--	--	
Collector-Emitter Breakdown Voltage	I _C = 10mA, I _B = 0	BV _{CEO}	400	--	--	V
Emitter-Base Breakdown Voltage	I _E = 1mA, I _C = 0	BV _{EBO}	9	--	--	V
Collector-Emitter Cutoff Current	V _{CE} = 400V, I _B = 0	I _{CEO}	--	--	1	uA
Collector Cutoff Current	V _{CB} = 800V, I _E = 0	I _{CBO}	--	--	1	uA
Emitter Cutoff Current	V _{EB} = 9V, I _C = 0	I _{EBO}	--	0.1	1	uA
Collector-Emitter Saturation Voltage	I _C / I _B = 0.5A / 0.1A	V _{CE(SAT)1}	--	0.2	0.5	V
	I _C / I _B = 1.0A / 0.25A	V _{CE(SAT)2}	--	0.35	0.8	
	I _C / I _B = 1.5A / 0.5A	V _{CE(SAT)3}	--	0.6	1.5	
Base-Emitter Saturation Voltage	I _C / I _B = 0.5A / 0.1A	V _{BE(SAT)1}	--	--	1.1	V
	I _C / I _B = 1.0A / 0.25A	V _{BE(SAT)2}	--	--	1.3	
DC Current Gain	V _{CE} = 2V, I _C = 10mA	h _{FE1}	15	--	--	
	V _{CE} = 2V, I _C = 400mA	h _{FE2}	20	--	40	
	V _{CE} = 2V, I _C = 1A	h _{FE3}	6	--	20	
DC Current Gain	V _{CE} = 2V, I _C = 400mA, T _C =120°C	h _{FE4}	15	--	25	
Dynamic						
Frequency	V _{CE} = 10V, I _C = 0.1A	f _T	4	--	--	MHz
Output Capacitance	V _{CB} = 10V, f = 0.1MHz	C _{ob}	--	21	--	pF
Resistive Load Switching Time (Ratings)						
Delay Time	V _{CC} = 125V, I _C = 1A, I _{B1} = I _{B2} = 200mA, t _p = 25uS, T _C =25°C Duty Cycle ≤1%	t _d	--	0.1	0.2	uS
Rise Time		t _r	--	0.6	1	uS
Storage Time		t _{STG}	--	2	4	uS
Fall Time		t _f	--	0.2	0.6	uS
Delay Time	V _{CC} = 125V, I _C = 0.4A, I _{B1} = 15mA, I _{B2} = 150mA, t _p = 25uS, T _C =25°C Duty Cycle ≤ 1%	t _d	--	0.10	0.13	uS
Rise Time		t _r	--	0.38	0.51	uS
Storage Time		t _{STG}	--	0.34	0.43	uS
Fall Time		t _f	--	0.03	0.05	uS
Delay Time	V _{CC} = 125V, I _C = 0.4A, I _{B1} = 15mA, I _{B2} = 150mA, t _p = 25uS, T _C =120°C Duty Cycle ≤ 1%,	t _d	--	0.13	--	uS
Rise Time		t _r	--	0.66	--	uS
Storage Time		t _{STG}	--	0.25	--	uS
Fall Time		t _f	--	0.05	--	uS

Note: pulse test: pulse width ≤300uS, duty cycle ≤2%

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

Figure 1. Static Characteristics

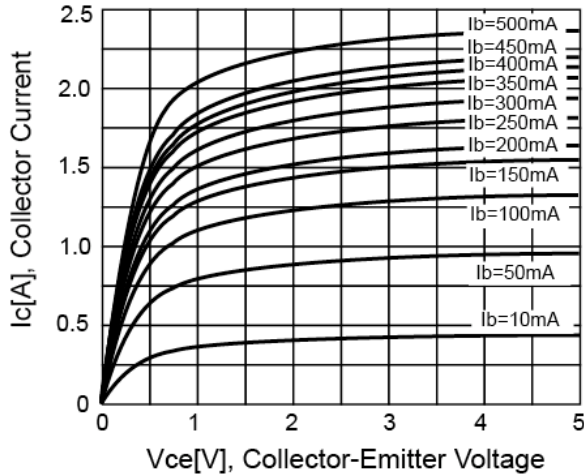


Figure 2. DC Current Gain

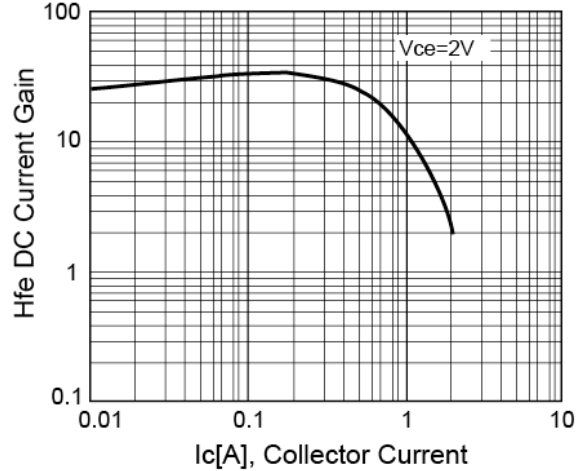


Figure 3. $V_{CE(SAT)}$ v.s. $V_{BE(SAT)}$

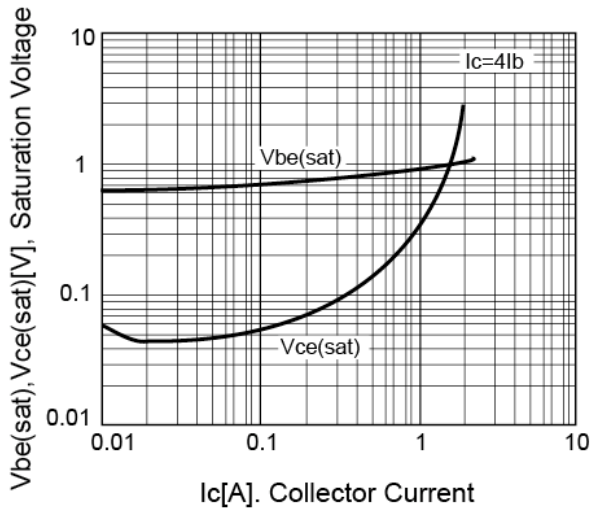


Figure 4. Power Derating

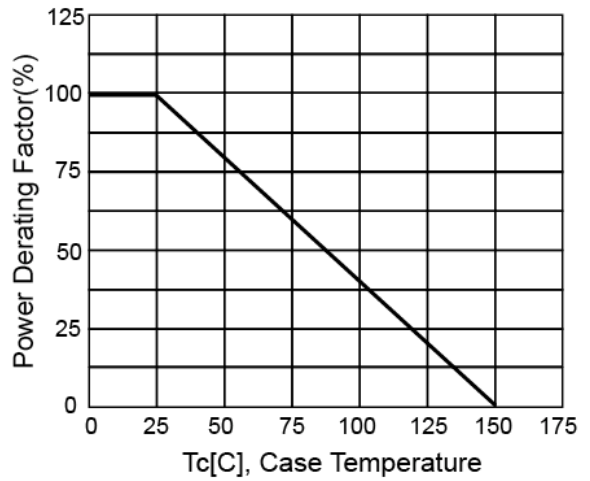


Figure 5. Reverse Bias SOA

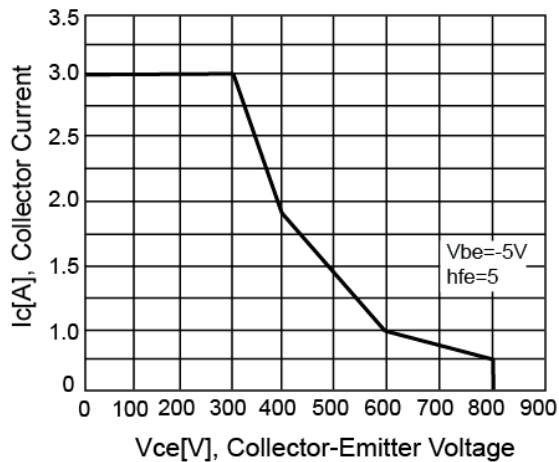
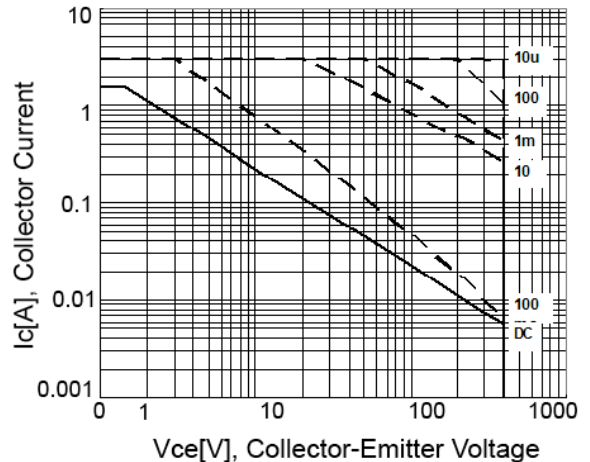
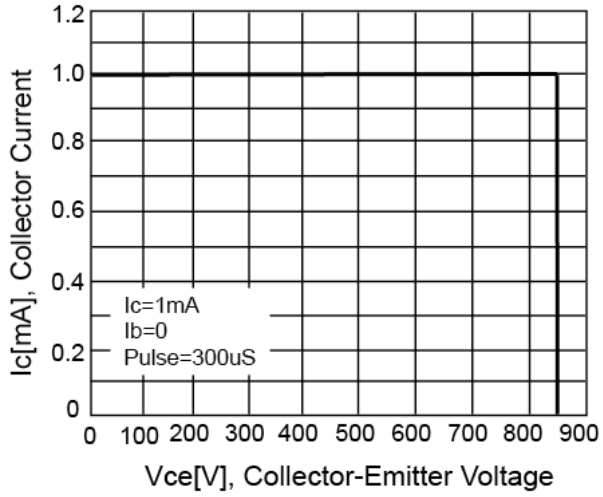


Figure 6. Safety Operating Area

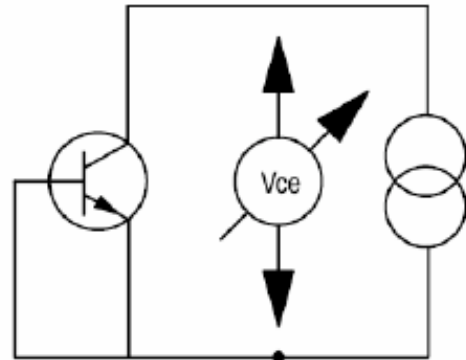


Electrical Characteristics Curve (T_c = 25°C)

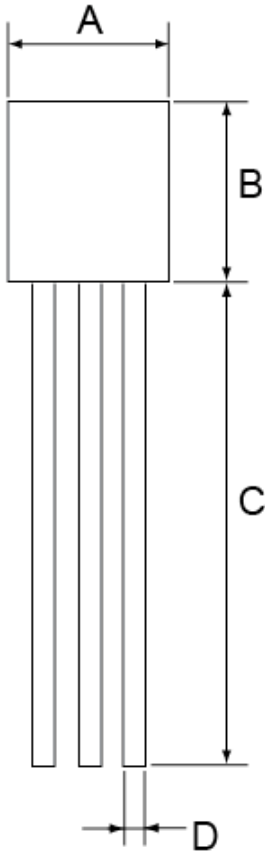
Figure 7. Vces Curve



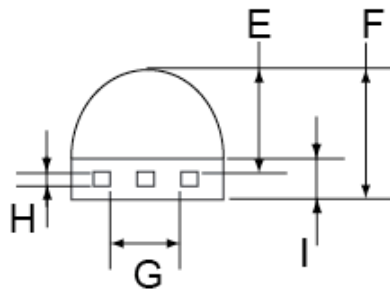
Vces Test Circuit



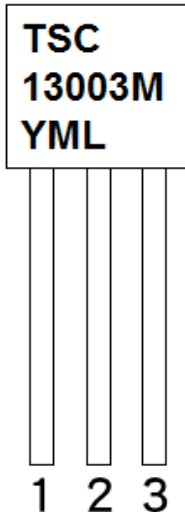
TO-92 Mechanical Drawing



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
I	1.10	1.30	0.043	0.051



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

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