



TO-220



ITO-220



Pin Definition:

1. Base
2. Collector
3. Emitter

PRODUCT SUMMARY

BV_{CEO}	400V
BV_{CBO}	700V
I_C	4A
$V_{CE(SAT)}$	1V @ $I_C / I_B = 4A / 1A$

Features

- High Voltage
- High Speed Switching

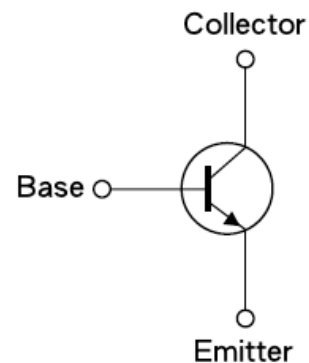
Structure

- Silicon Triple Diffused Type
- NPN Silicon Transistor

Ordering Information

Part No.	Package	Packing
TS13005CZ C0	TO-220	50pcs / Tube
TS13005CI C0	ITO-220	50pcs / Tube

Block Diagram



Absolute Maximum Rating ($T_a = 25^\circ\text{C}$ 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	I_C	DC	4	A
		Pulse	8	
Base Current	I_B	DC	2	A
		Pulse	4	
Total Power Dissipation	P_{tot}	TO-220	75	W
		ITO-220	30	
Operating Junction Temperature	T_J	+150	$^\circ\text{C}$	
Operating Junction and Storage Temperature Range	T_{STG}	- 55 to +150	$^\circ\text{C}$	

Note: Single Pulse. $P_w = 300\mu\text{S}$, Duty $\leq 2\%$

Electrical Specifications ($T_a = 25^\circ\text{C}$ 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	$I_E = 0.1\text{mA}, I_C = 0$	BV_{EBO}	9	--	--	V
Collector Cutoff Current	$V_{CE} = 400\text{V}, I_B = 0$	I_{CEO}	--	--	250	μA
Collector Cutoff Current	$V_{CB} = 700\text{V}, I_E = 0$	I_{CBO}	--	--	1	mA
Emitter Cutoff Current	$V_{EB} = 9\text{V}, I_C = 0$	I_{EBO}	--	--	1	mA
Collector-Emitter Saturation Voltage	$I_C = 1\text{A}, I_B = 0.2\text{A}$	$V_{CE(SAT)1}$	--	--	0.5	V
	$I_C = 2\text{A}, I_B = 0.5\text{A}$	$V_{CE(SAT)2}$	--	--	0.6	
	$I_C = 4\text{A}, I_B = 1\text{A}$	$V_{CE(SAT)3}$	--	--	1	
Base-Emitter Saturation Voltage	$I_C = 1\text{A}, I_B = 0.2\text{A}$	$V_{BE(SAT)1}$	--	--	1.2	V
	$I_C = 2\text{A}, I_B = 0.5\text{A}$	$V_{BE(SAT)2}$	--	--	1.6	
DC Current Gain	$V_{CE} = 5\text{V}, I_C = 1\text{A}$	h_{FE}	15	--	32	
	$V_{CE} = 5\text{V}, I_C = 2\text{A}$		8	--	40	
Dynamic						
Frequency	$V_{CE} = 10\text{V}, I_C = 0.5\text{A}$	f_T	4	--	--	MHz
Output Capacitance	$V_{CB} = 10\text{V}, f = 0.1\text{MHz}$	C_{ob}	--	65	--	pF
Resistive Load						
Turn On Time	$V_{CC} = 125\text{V}, I_C = 2\text{A},$ $I_{B1} = I_{B2} = 0.4\text{A}, t_P = 25\mu\text{S}$ Duty Cycle $\leq 1\%$	t_{ON}	--	0.3	0.7	μS
Storage Time		t_{STG}	--	2.2	3	μS
Fall Time		t_f	--	0.3	0.5	μS

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

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

Figure 1. Static Characteristics

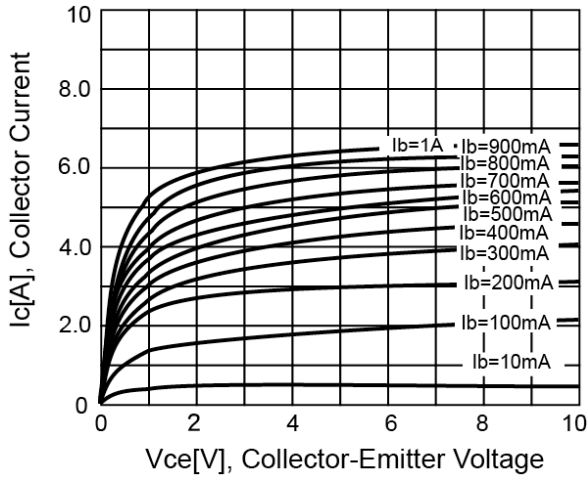


Figure 2. DC Current Gain

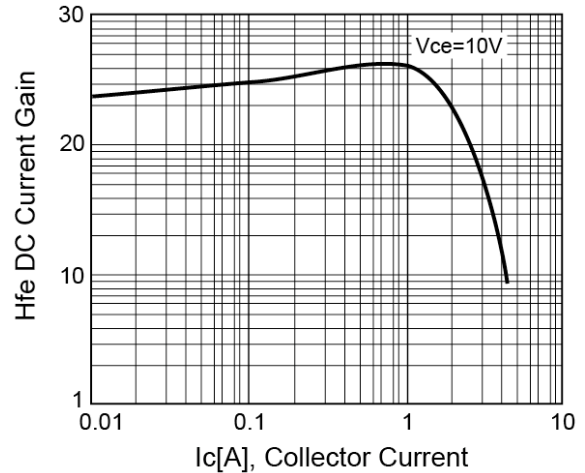


Figure 3. $V_{CE(SAT)}$ v.s. $V_{BE(SAT)}$

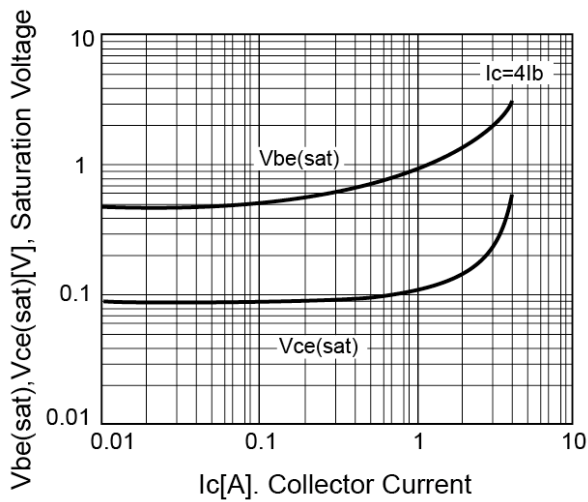


Figure 4. Power Derating

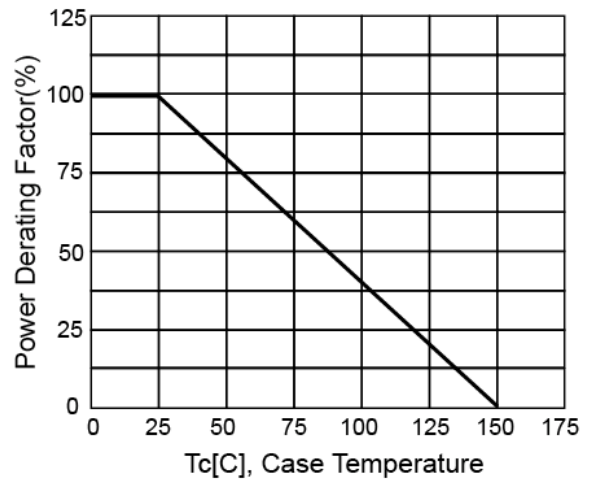


Figure 5. Reverse Bias SOA

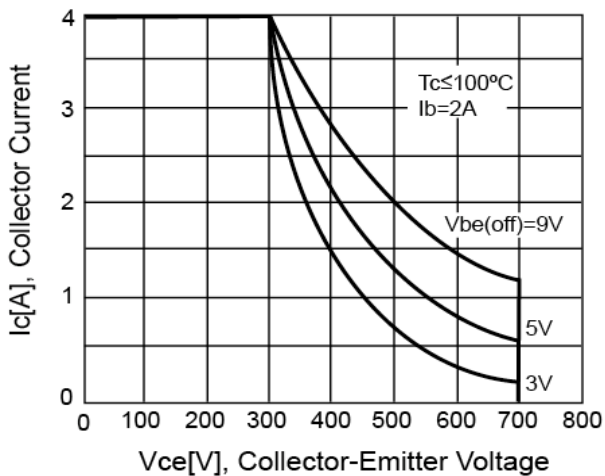
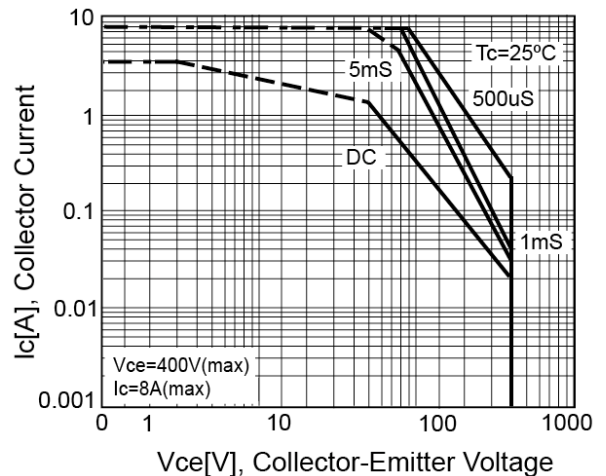
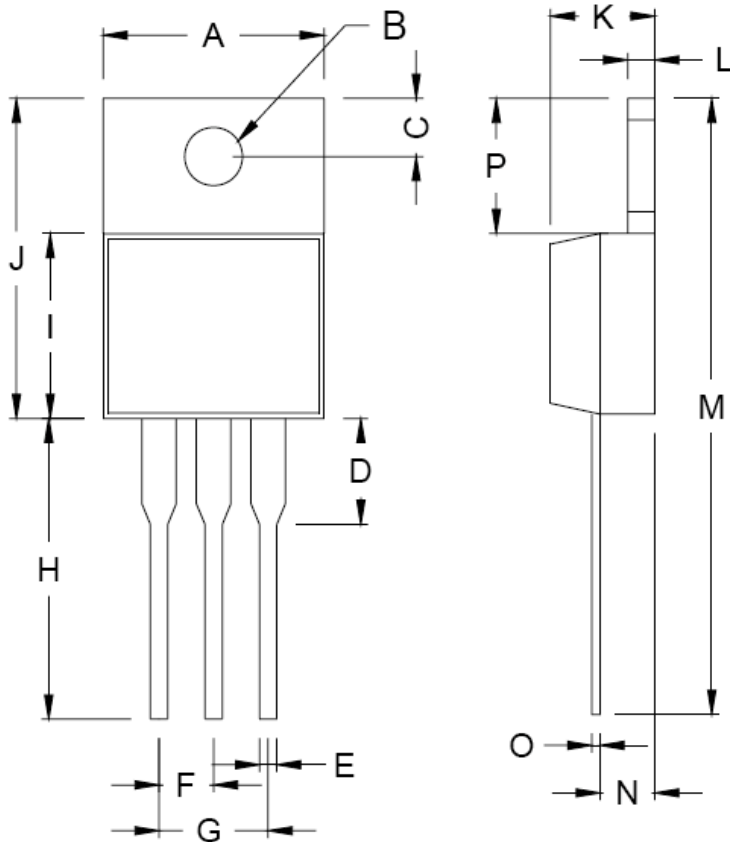


Figure 6. Safety Operating Area

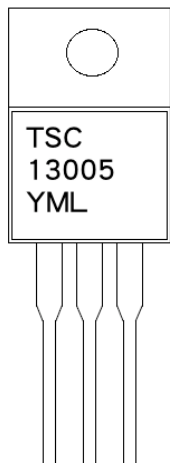


TO-220 Mechanical Drawing



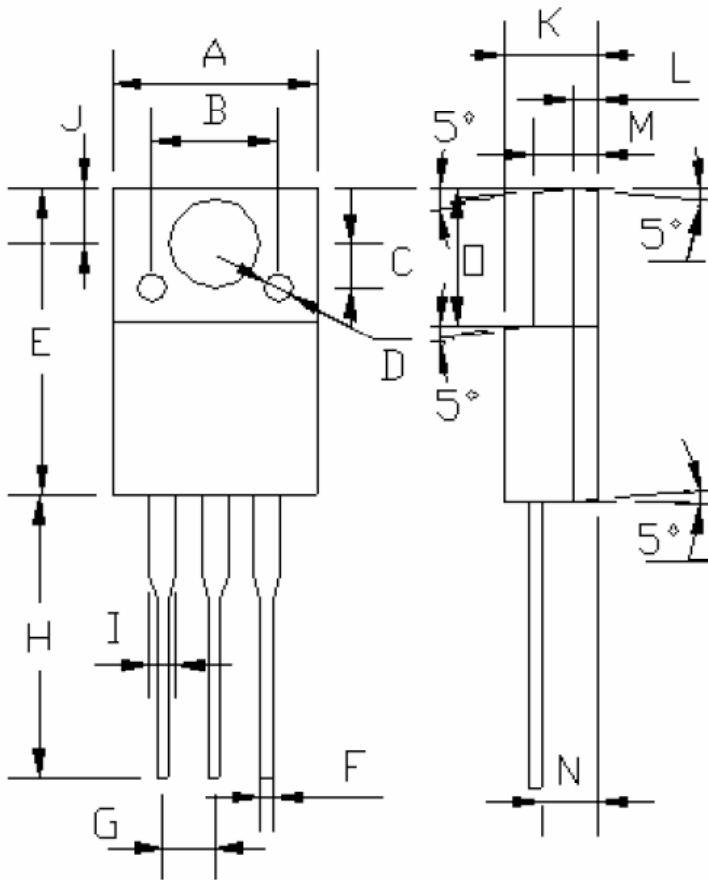
TO-220 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.31	10.550	0.366	0.415
B	3.740	3.910	0.147	0.154
C	2.440	2.940	0.096	0.116
D	2.22	3.22	0.087	0.127
E	0.78	0.98	0.030	0.038
F	2.34	2.65	0.092	0.104
G	4.69	5.31	0.184	0.209
H	12.32	13.88	0.485	0.546
I	8.74	9.26	0.344	0.364
J	15.07	16.07	0.593	0.632
K	4.35	4.65	0.171	0.183
L	1.16	1.40	0.045	0.055
M	27.39	30.35	1.078	1.194
N	1.785	2.675	0.070	0.105
O	1.50	1.75	0.059	0.068
P	5.75	7.65	0.226	0.301

Marking Diagram



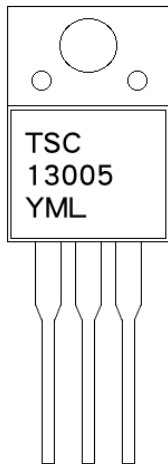
- Y** = Year Code
- M** = Month Code
(A=Jan, B=Feb, C=Mar, D=Apr, E=May, F=Jun, G=Jul, H=Aug, I=Sep, J=Oct, K=Nov, L=Dec)
- L** = Lot Code

ITO-220 Mechanical Drawing



ITO-220 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.04	10.07	0.395	0.396
B	6.20 (typ.)		0.244 (typ.)	
C	2.20 (typ.)		0.087 (typ.)	
D	φ 1.40 (typ.)		φ 0.055 (typ.)	
E	15.0	15.20	0.591	0.598
F	0.52	0.54	0.020	0.021
G	2.35	2.73	0.093	0.107
H	13.50	13.55	0.531	0.533
I	1.11	1.49	0.044	0.058
J	2.60	2.80	0.102	0.110
K	4.49	4.50	0.176	0.177
L	1.15 (typ.)		0.045 (typ.)	
M	3.03	3.05	0.119	0.120
N	2.60	2.80	0.102	0.110
O	6.55	6.65	0.258	0.262

Marking Diagram



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