TAIWAN SEMICONDUCTOR

RoHS COMPLIANCE

TS13005

High Voltage NPN Transistor

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

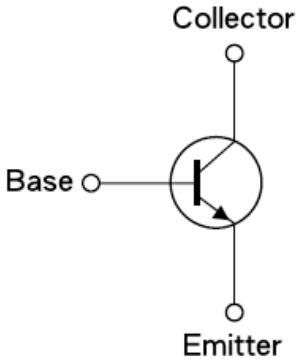
Features

- High Voltage
- High Speed Switching

Structure

- Silicon Triple Diffused Type
- NPN Silicon Transistor

Block Diagram



Ordering Information

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

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	4	A
	Pulse		8	
Base Current	DC	I_B	2	A
	Pulse		4	
Total Power Dissipation	TO-220	P_{tot}	75	W
	ITO-220		30	
Operating Junction Temperature		T_J	+150	°C
Operating Junction and Storage Temperature Range		T_{STG}	- 55 to +150	°C

Note: Single Pulse. P_W = 300uS, Duty ≤2%

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

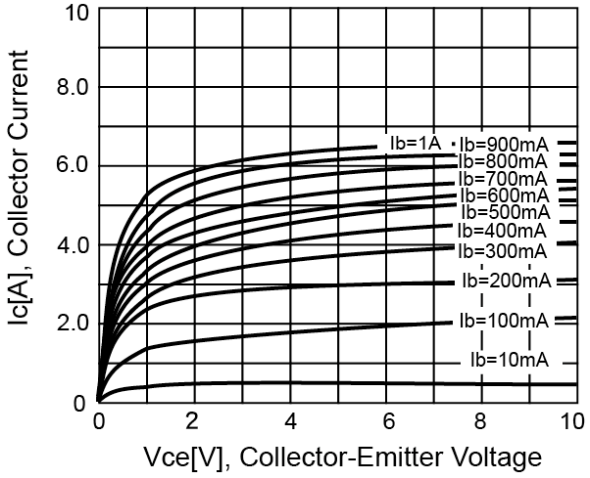


Figure 2. DC Current Gain

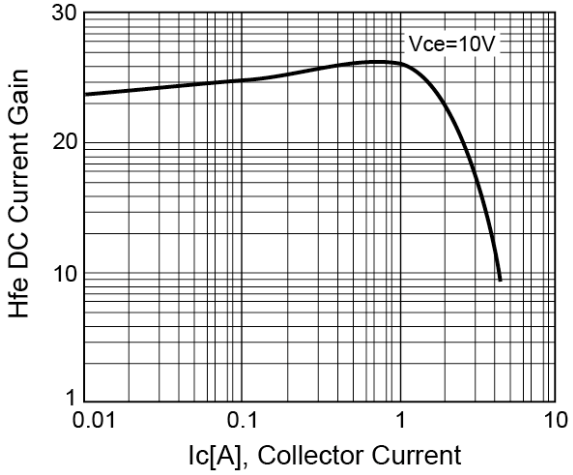


Figure 3. $V_{CE(SAT)}$ v.s. $V_{BE(SAT}$

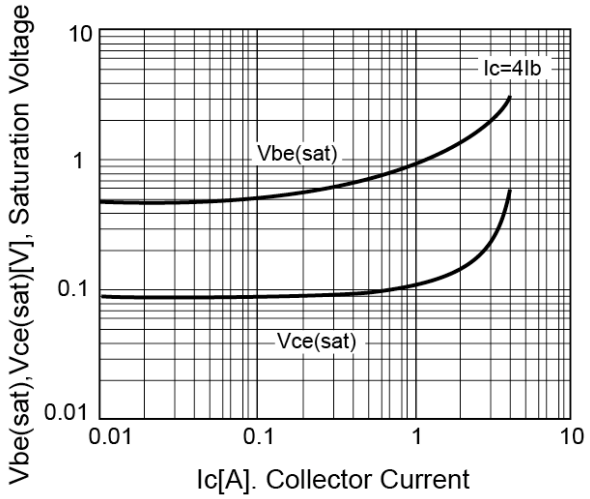


Figure 4. Power Derating

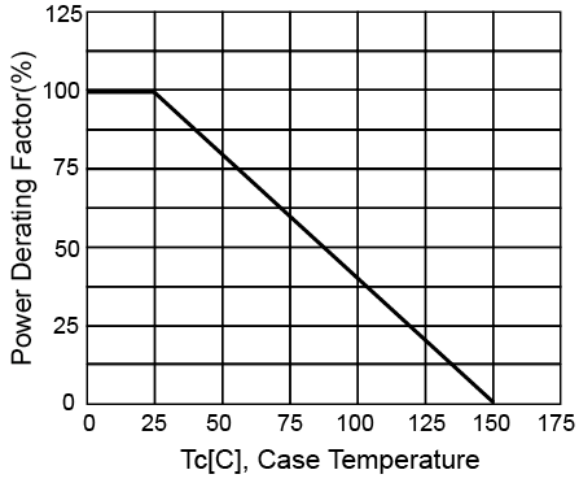


Figure 5. Reverse Bias SOA

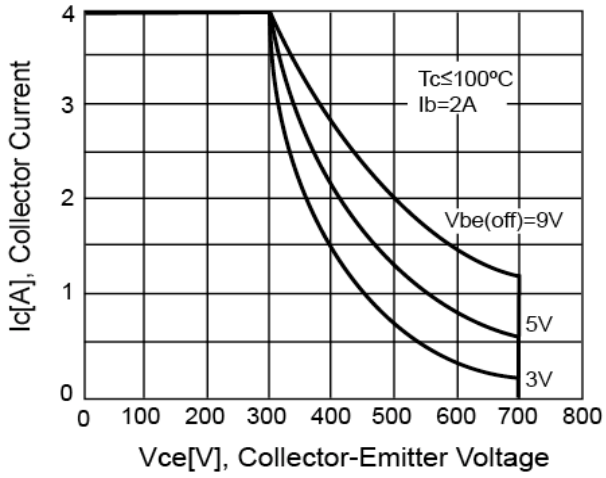
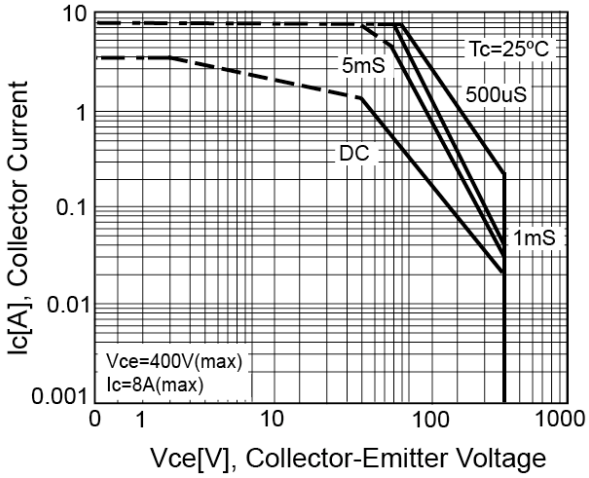


Figure 6. Safety Operating Area



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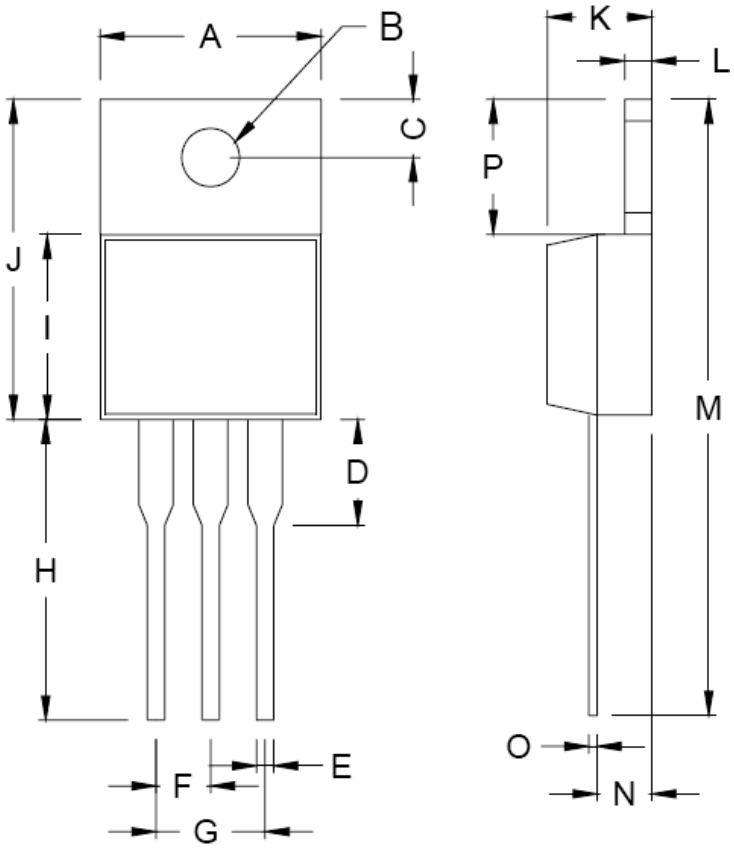
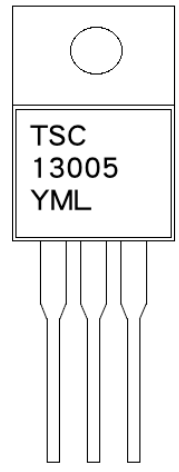
TO-220 Mechanical Drawing



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**=Apl, **E**=May, **F**=Jun, **G**=Jul, **H**=Aug, **I**=Sep, **J**=Oct, **K**=Nov, **L**=Dec)
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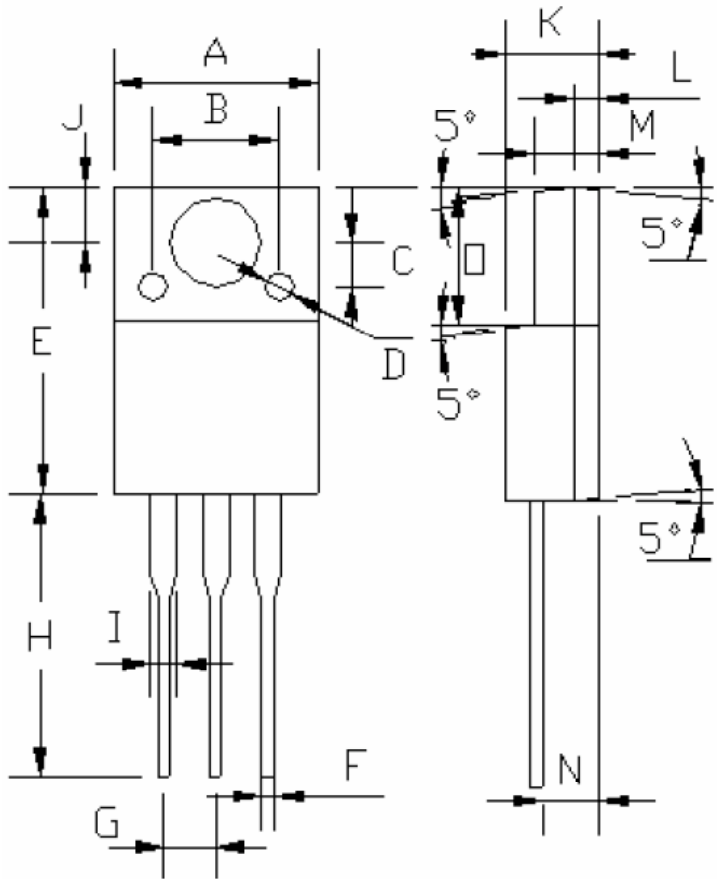
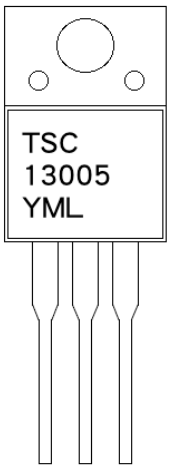
ITO-220 Mechanical Drawing



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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