TAIWAN SEMICONDUCTOR

RoHS COMPLIANCE

TS13009

High Voltage NPN Transistor

TO-220



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

PRODUCT SUMMARY

BV_{CEO}	400V
BV_{CBO}	700V
I_C	12A
$V_{CE(SAT)}$	1.5V @ I_C / I_B = 12A / 3A

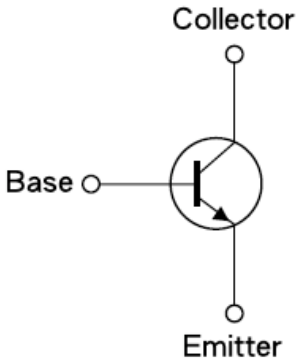
Features

- High Voltage
- High Speed Switching

Structure

- Silicon Triple Diffused Type
- NPN Silicon Transistor

Block Diagram



Ordering Information

Part No.	Package	Packing
TS13009CZ C0	TO-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	12	A
	Pulse		24	
Base Current	DC	I_B	6	A
	Pulse		12	
Total Power Dissipation		P_D	100	W
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 =1mA, I_C =0	BV_{EBO}	9	--	--	V
Collector Cutoff Current	V_{CE} =400V, I_B=0	I_{CEO}	--	--	1	mA
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=5A, I_B =1A I_C=8A, I_B =1.6A I_C=12A, I_B =3A	$V_{CE(SAT)1}$ $V_{CE(SAT)2}$ $V_{CE(SAT)3}$	-- -- --	-- -- --	1 1.5 3	V
Base-Emitter Saturation Voltage	I_C=5A, I_B =1A I_C=8A, I_B =1.6A	$V_{BE(SAT)1}$ $V_{BE(SAT)2}$	-- --	-- --	1.2 1.6	V
DC Current Gain	V_{CE} =5V, I_C = 5A V_{CE} =5V, I_C = 8A	h_{FE}	8 6	-- --	40 30	
Dynamic						
Frequency	V_{CE} =10V, I_C =0.5A	f_T	4	--	--	MHz
Output Capacitance	V_{CB} =10V, f =0.1MHz	Cob	--	180	--	pF
Resistive Load Switching Time (Ratings)						
Delay Time	V_{CC} =125V, I_C =8A, I_{B1} =I_{B2}=1.6A, t_P =25uS Duty Cycle ≤1%	t_d	--	0.06	0.1	uS
Rise Time		t_r		0.45	1	uS
Storage Time		t_{STG}	--	2.8	3.3	uS
Fall Time		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

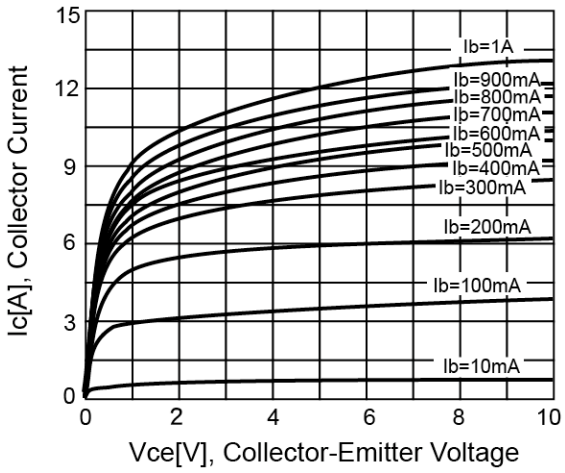


Figure 2. DC Current Gain

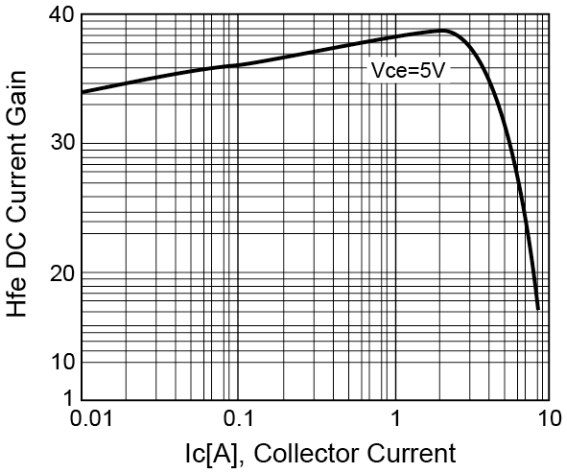


Figure 3. $V_{CE(SAT)}$ v.s. $V_{BE(SAT}$

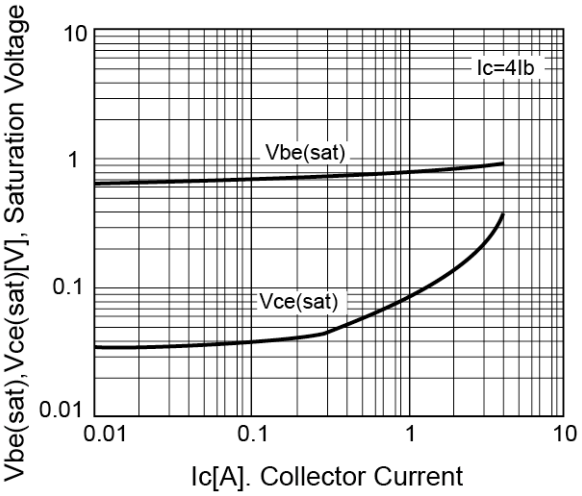
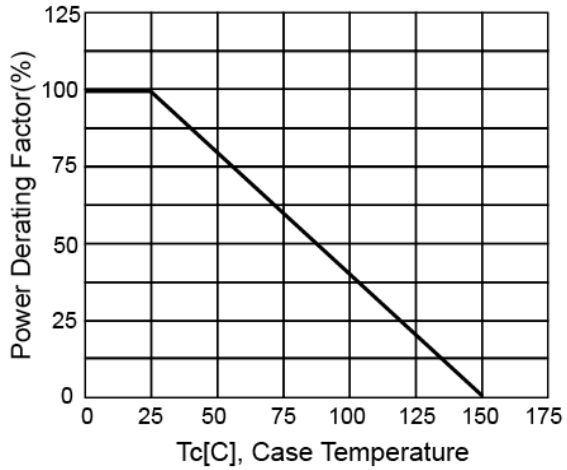


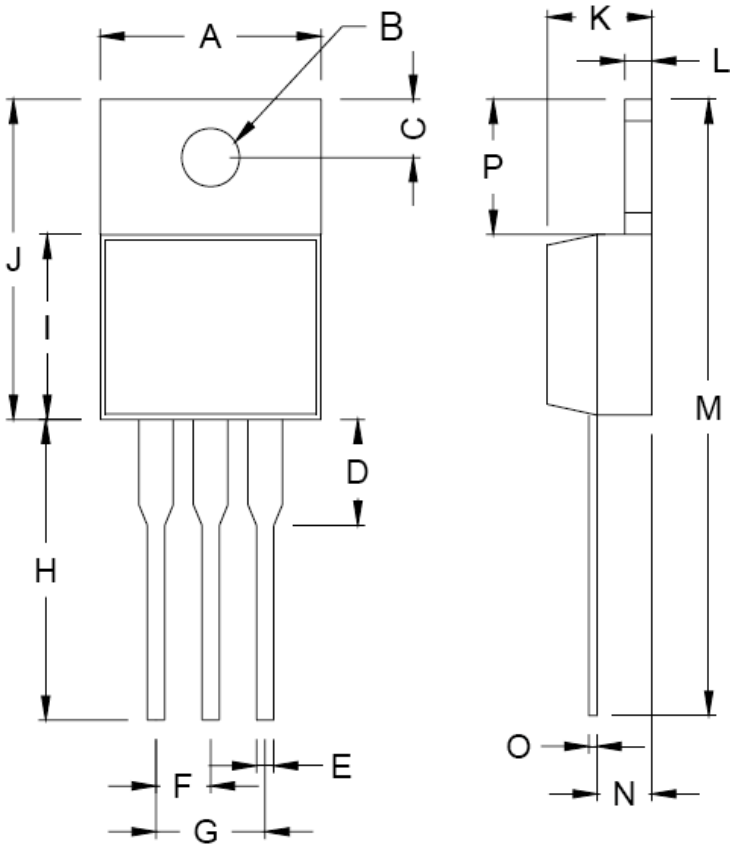
Figure 4. Power Derating



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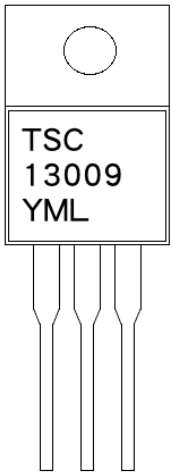
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TO-220 Mechanical Drawing



TO-220 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.000	10.500	0.394	0.413
B	3.740	3.910	0.147	0.154
C	2.440	2.940	0.096	0.116
D	-	6.350	-	0.250
E	0.381	1.106	0.015	0.040
F	2.345	2.715	0.092	0.058
G	4.690	5.430	0.092	0.107
H	12.700	14.732	0.500	0.581
J	14.224	16.510	0.560	0.650
K	3.556	4.826	0.140	0.190
L	0.508	1.397	0.020	0.055
M	27.700	29.620	1.060	1.230
N	2.032	2.921	0.080	0.115
O	0.255	0.610	0.010	0.024
P	5.842	6.858	0.230	0.270

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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