



DONGGUAN NANJING ELECTRONICS LTD.,

TO-220 Plastic-Encapsulate Transistors

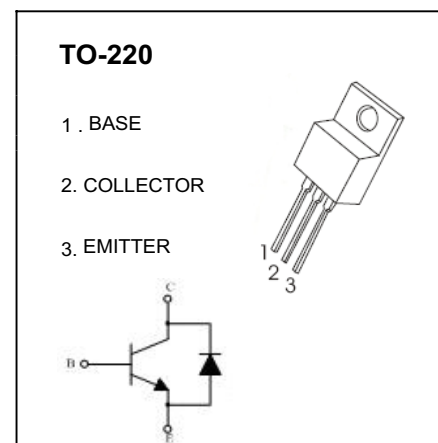
13005 TRANSISTOR (NPN)

FEATURES

- Power switching applications
- Good high temperature
- Low saturation voltage
- High speed switching

MAXIMUM RATINGS ($T_a=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Unit
V_{CBO}	Collector-Base Voltage	700	V
V_{CEO}	Collector-Emitter Voltage	420	V
V_{EBO}	Emitter-Base Voltage	9	V
I_C	Collector Current -Continuous	4	A
P_C	Collector Power Dissipation	2	W
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	62.5	$^\circ\text{C}/\text{W}$
T_j	Junction Temperature	150	$^\circ\text{C}$
T_{stg}	Storage Temperature	-55-150	$^\circ\text{C}$



ELECTRICAL CHARACTERISTICS ($T_a=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Collector-base breakdown voltage	$V_{(BR)CBO}$	$I_C=1\text{mA}, I_E=0$	700			V
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C=10\text{mA}, I_B=0$	420			V
Emitter-base breakdown voltage	$V_{(BR)EBO}$	$I_E=1\text{mA}, I_C=0$	9			V
Collector cut-off current	I_{CBO}	$V_{CB}=700\text{V}, I_E=0$			50	μA
Collector cut-off current	I_{CEO}	$V_{CE}=400\text{V}, I_B=0$			50	μA
Emitter cut-off current	I_{EBO}	$V_{EB}=7\text{V}, I_C=0$			50	μA
DC current gain	$h_{FE(1)}$	$V_{CE}=5\text{V}, I_C=1\text{A}$	10		40	
	$h_{FE(2)}$	$V_{CE}=5\text{V}, I_C=200\text{mA}$	10		60	
	$h_{FE(3)}$	$V_{CE}=5\text{V}, I_C=10\text{mA}$	5			
	$h_{FE(4)}$	$V_{CE}=5\text{V}, I_C=4\text{A}$	8		40	
Collector-emitter saturation voltage	$V_{CE(sat)(1)}$	$I_C=1\text{A}, I_B=0.2\text{A}$			0.3	V
	$V_{CE(sat)(2)}$	$I_C=2\text{A}, I_B=0.4\text{A}$	A	0.15	0.28	V
			B	0.25	0.35	V
$V_{CE(sat)(3)}$	$I_C=4\text{A}, I_B=1\text{A}$			0.8	V	
Base-emitter saturation voltage	$V_{BE(sat)}$	$I_C=2\text{A}, I_B=0.5\text{A}$			1.6	V
Diode forward voltage	V_{FEC}	$I_C=2\text{A}$			2	V
Transition frequency	f_T	$V_{CE}=10\text{V}, I_C=0.5\text{A}, f=1\text{MHz}$	5			MHz
Rise time	t_r	$I_C=250\text{mA}$			0.5	μs
Storage time	t_s	$I_C=250\text{mA}$	2.0		4.0	
Fall time	t_f	$I_C=250\text{mA}$			0.5	

CLASSIFICATION of $h_{FE(2)}$

Range	10~15	15~20	20~25	25~30	30~35	35~40	40~45	45~50	50~55	55~60
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

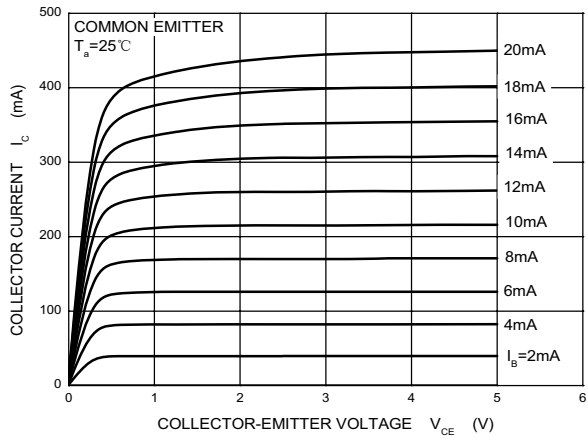
CLASSIFICATION of $t_s(\mu\text{s})$

Rank	A1	A2	B1	B2
Range	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0

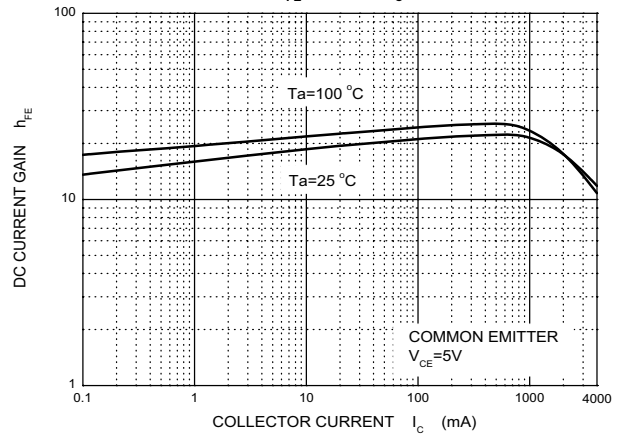
Typical Characteristics

13005

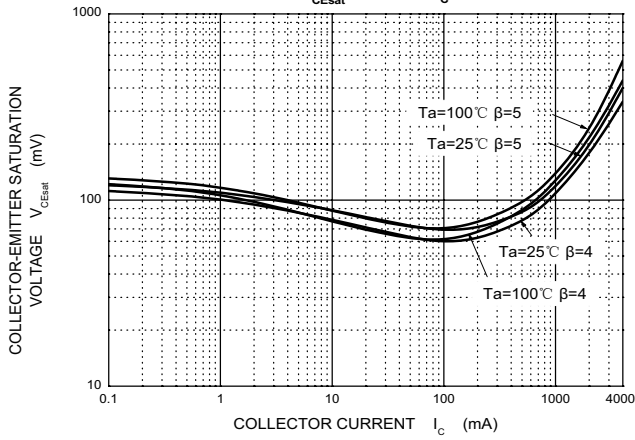
Static Characteristic



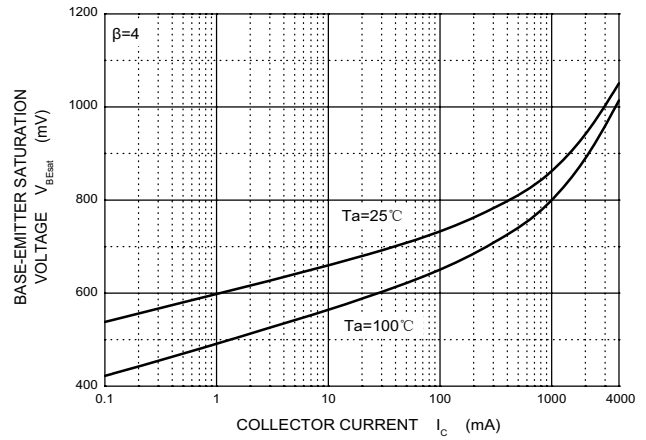
h_{FE} — I_c



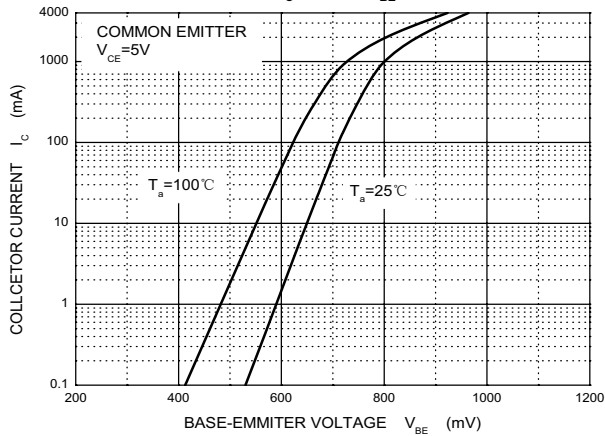
V_{CEsat} — I_c



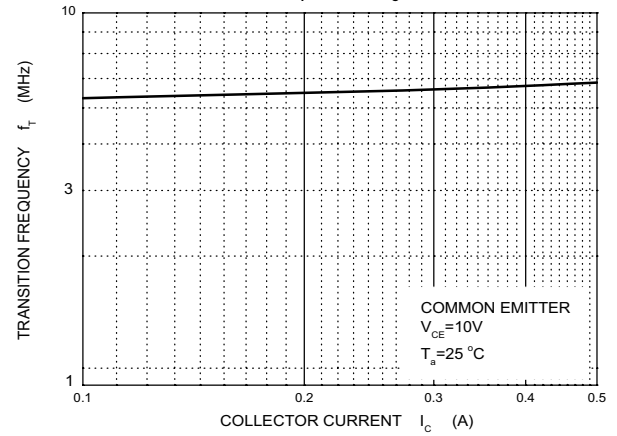
V_{BEsat} — I_c



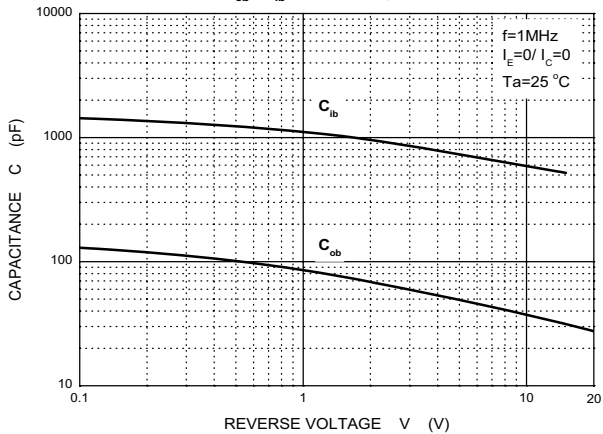
I_c — V_{BE}



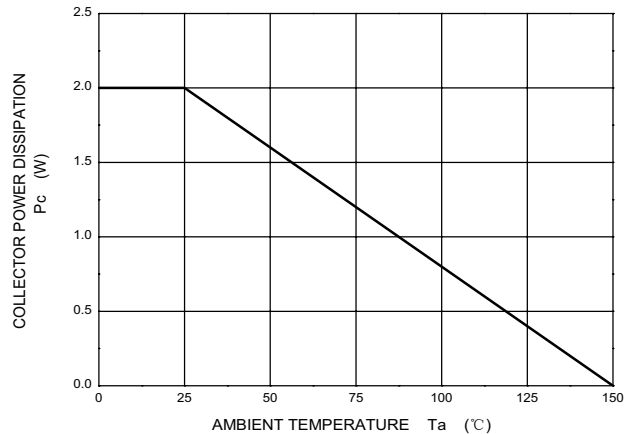
f_T — I_c



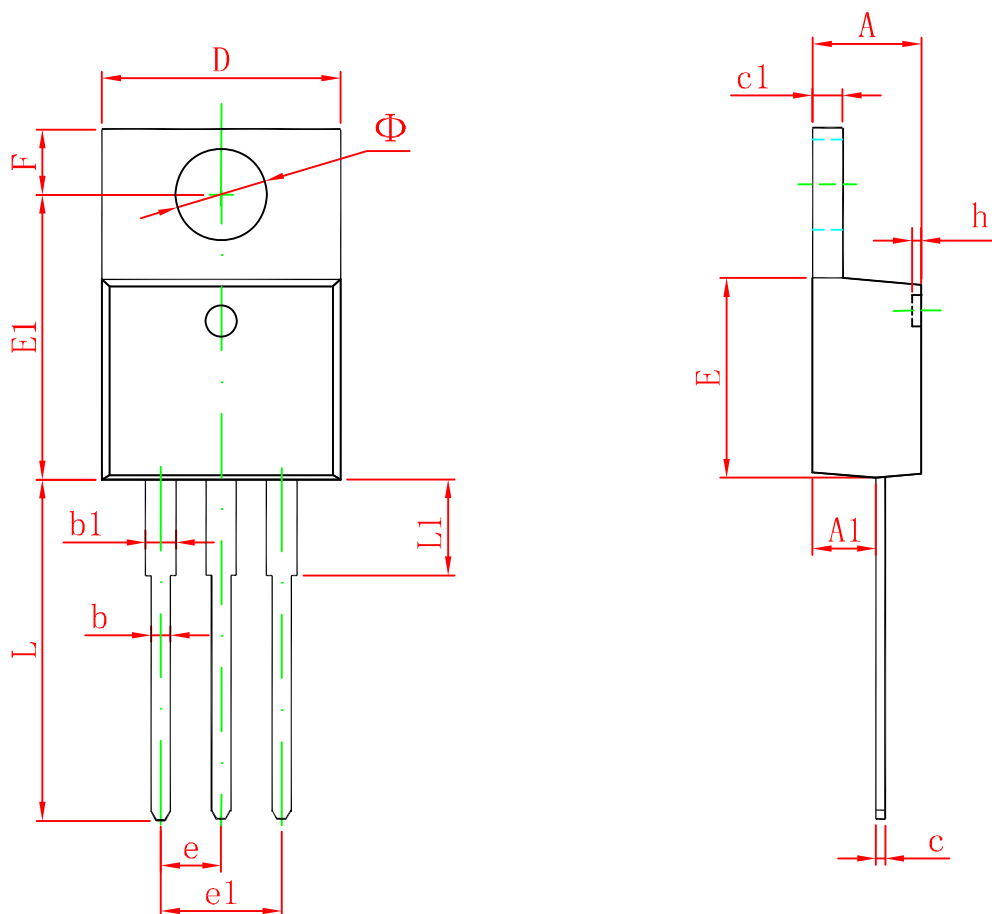
C_{ob}/C_{ib} — V_{CB}/V_{EB}



P_c — T_a



TO-220 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.470	4.670	0.176	0.184
A1	2.520	2.820	0.099	0.111
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.310	0.530	0.012	0.021
c1	1.170	1.370	0.046	0.054
D	10.010	10.310	0.394	0.406
E	8.500	8.900	0.335	0.350
E1	12.060	12.460	0.475	0.491
e	2.540 TYP		0.100 TYP	
e1	4.980	5.180	0.196	0.204
F	2.590	2.890	0.102	0.114
h	0.000	0.300	0.000	0.012
L	13.400	13.800	0.528	0.543
L1	3.560	3.960	0.140	0.156
Φ	3.735	3.935	0.147	0.155