

TO-92 Plastic-Encapsulate Transistors

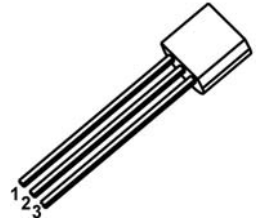
S9013 TRANSISTOR (NPN)

FEATURES

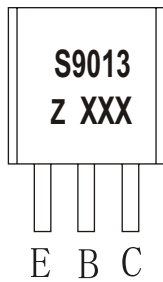
- Complementary to S9012
- Excellent h_{FE} linearity

TO-92

1. EMITTER
2. BASE
3. COLLECTOR

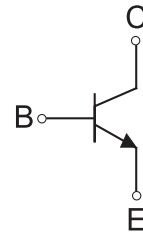


MARKING



S9013=Device code
Z=Rank of h_{FE}
XXX=Code
GXX=Green molding compound device
CXX=Normal molding compound device

Equivalent Circuit



ORDERING INFORMATION

Part Number	Package	Packing Method	Pack Quantity
S9013	TO-92	Bulk	1000pcs/Bag
S9013-TA	TO-92	Tape	2000pcs/Box

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

Symbol	Parameter	Value	Unit
V_{CBO}	Collector-Base Voltage	40	V
V_{CEO}	Collector-Emitter Voltage	25	V
V_{EBO}	Emitter-Base Voltage	5	V
I_C	Collector Current -Continuous	0.5	A
P_D	Collector Power Dissipation	625	mW
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	200	$^{\circ}\text{C} / \text{W}$
T_J, T_{stg}	Operation Junction and Storage Temperature Range	-55~+150	$^{\circ}\text{C}$

ELECTRICAL CHARACTERISTICS

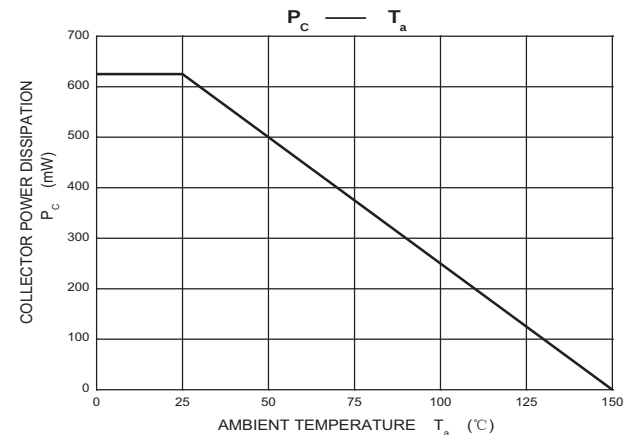
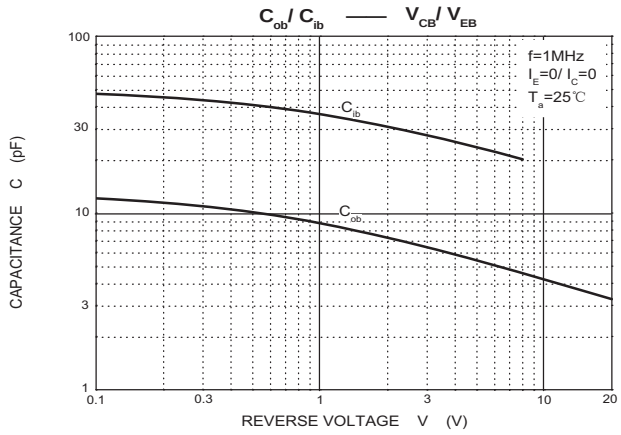
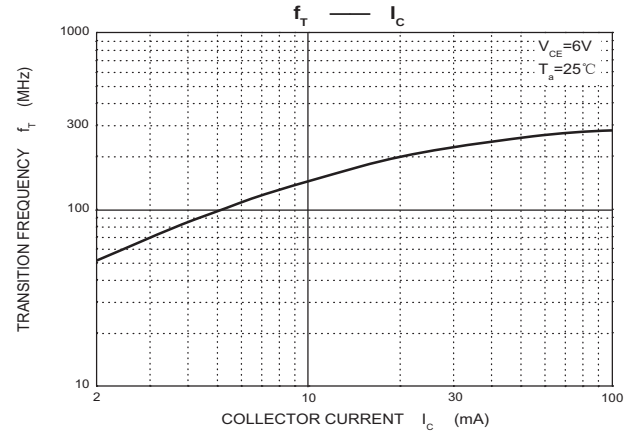
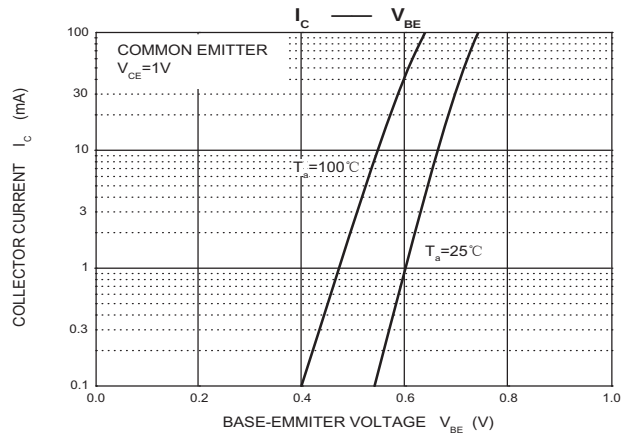
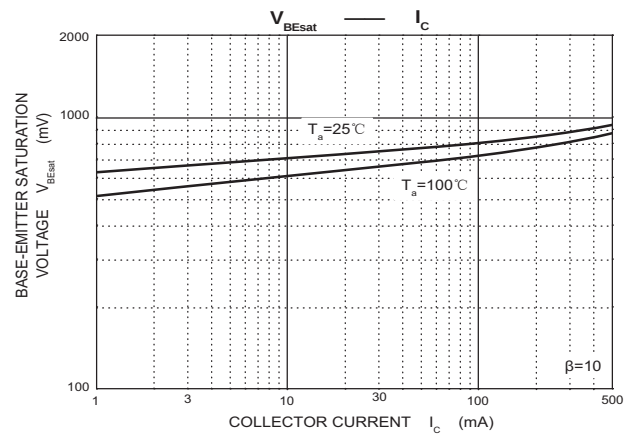
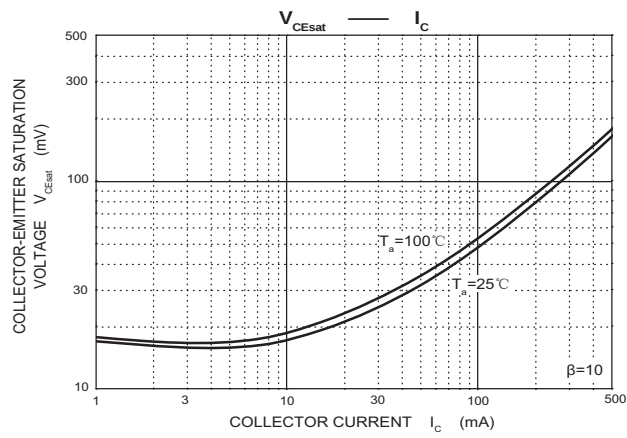
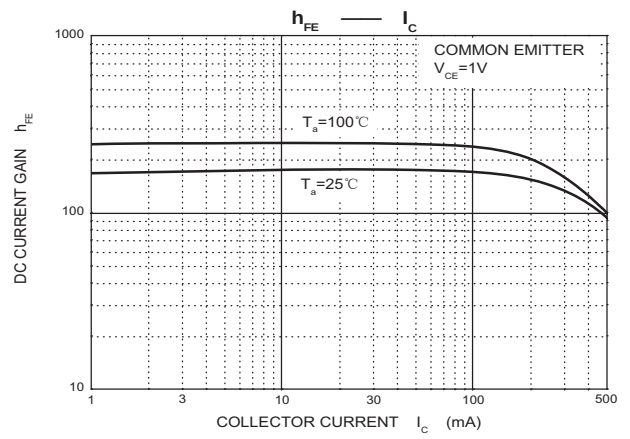
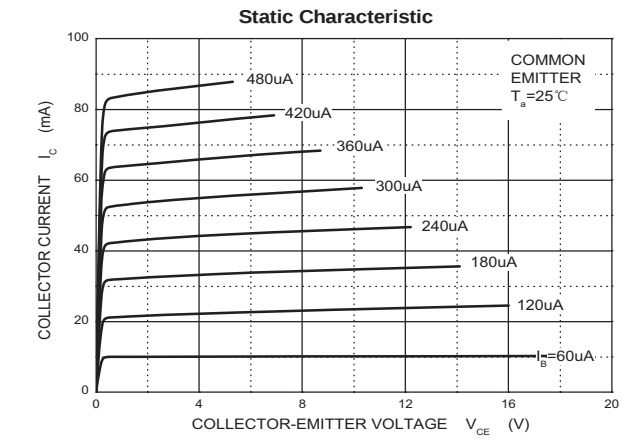
$T_a = 25^\circ\text{C}$ unless otherwise specified

Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Collector-base breakdown voltage	$V_{(BR)CBO}$	$I_C = 100\mu\text{A}$, $I_E = 0$	40			V
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = 1\text{mA}$, $I_B = 0$	25			V
Emitter-base breakdown voltage	$V_{(BR)EBO}$	$I_E = 100\mu\text{A}$, $I_C = 0$	5			V
Collector cut-off current	I_{CBO}	$V_{CB} = 40\text{V}$, $I_E = 0$			0.1	μA
Collector cut-off current	I_{CEO}	$V_{CE} = 20\text{V}$, $I_E = 0$			0.1	μA
Emitter cut-off current	I_{EBO}	$V_{EB} = 5\text{V}$, $I_C = 0$			0.1	μA
DC current gain	$h_{FE(1)}$	$V_{CE} = 1\text{V}$, $I_C = 50\text{mA}$	64		400	
	$h_{FE(2)}$	$V_{CE} = 1\text{V}$, $I_C = 500\text{mA}$	40			
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = 500\text{mA}$, $I_B = 50\text{mA}$			0.6	V
Base-emitter voltage	$V_{BE(sat)}$	$I_C = 500\text{mA}$, $I_B = 50\text{mA}$			1.2	V
Transition frequency	f_T	$V_{CE} = 6\text{V}$, $I_C = 20\text{mA}$, $f = 30\text{MHz}$	150			MHz

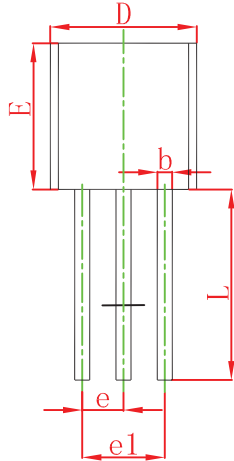
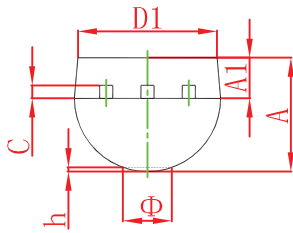
CLASSIFICATION OF $h_{FE(1)}$

Rank	D	E	F	G	H	I	J
Range	64-91	78-112	96-135	112-166	144-202	190-300	300-400

Typical Characteristics

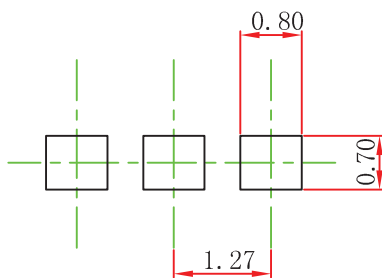


TO-92 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.300	3.700	0.130	0.146
A1	1.100	1.400	0.043	0.055
b	0.380	0.550	0.015	0.022
c	0.360	0.510	0.014	0.020
D	4.300	4.700	0.169	0.185
D1	3.430		0.135	
E	4.300	4.700	0.169	0.185
e	1.270 TYP		0.050 TYP	
e1	2.440	2.640	0.096	0.104
L	14.100	14.500	0.555	0.571
Φ		1.600		0.063
h	0.000	0.380	0.000	0.015

TO-92 Suggested Pad Layout



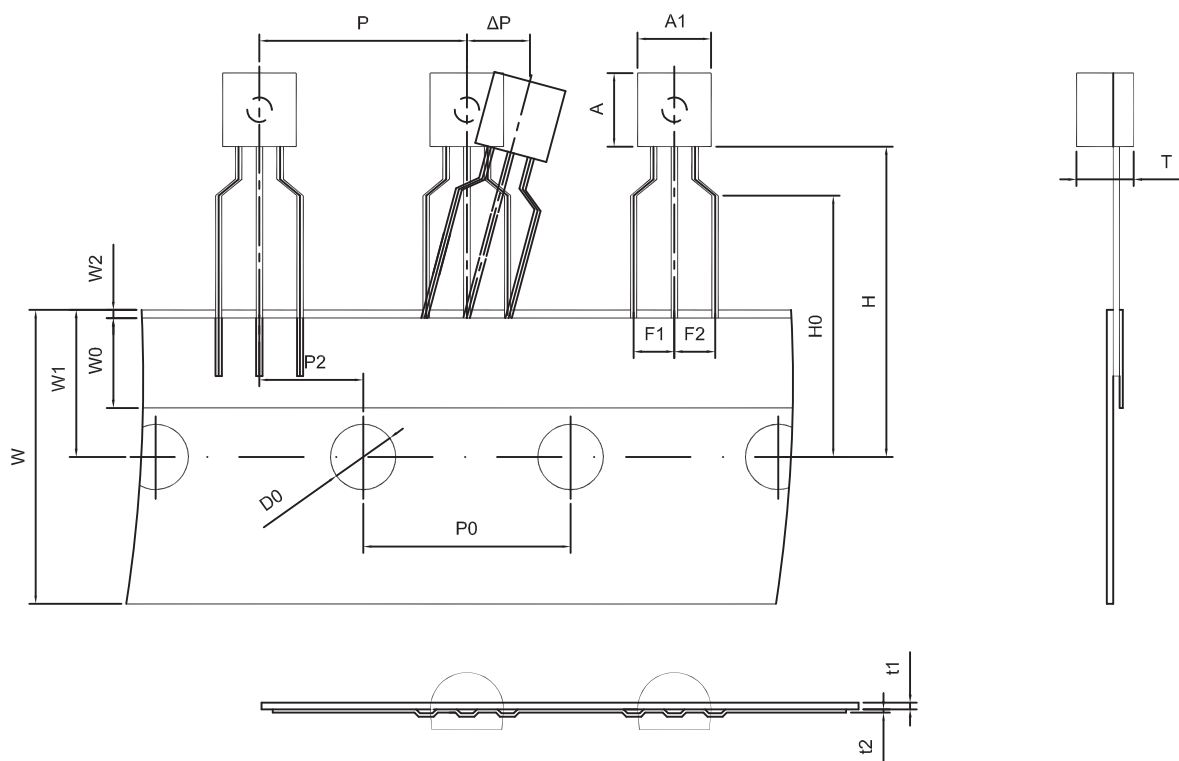
Note:

1. Controlling dimension: in millimeters.
2. General tolerance: $\pm 0.05\text{mm}$.
3. The pad layout is for reference purposes only.

NOTICE

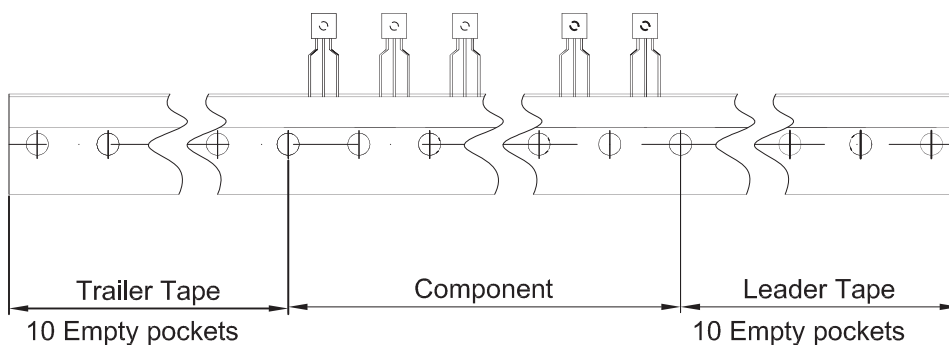
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TO-92 Tape and Reel



Dimiensions are in millimeter

A1	A	T	P	P0	P2	F1	F2	W
4.5	4.5	3.5	12.7	12.7	6.35	2.5	2.5	18.0
W0	W1	W2	H	H0	D0	t1	t2	ΔP
6.0	9.0	1.0 MAX.	19.0	16.0	4.0	0.4	0.2	0



Package	Box	Box Size(mm)	Carton	Carton Size(mm)
TO-92	2000 pcs	333×162×43	20,000 pcs	350×340×250