



# DONGGUAN NANJING ELECTRONICS LTD.,

## TO-92 Plastic-Encapsulate Transistors

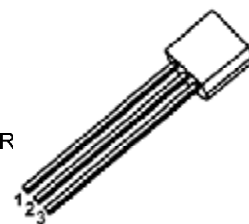
### 2SD1513 TRANSISTOR (NPN)

#### FEATURES

- Low Collector Saturation
- High DC Current Gain
- Complementary to The 2SB1068 PNP Transistor

TO-92

1. EMITTER
2. COLLECTOR
3. BASE



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

Symbol	Parameter	Value	Unit
$V_{CBO}$	Collector-Base Voltage	20	V
$V_{CEO}$	Collector-Emitter Voltage	16	V
$V_{EBO}$	Emitter-Base Voltage	6	V
$I_C$	Collector Current	2	A
$P_C$	Collector Power Dissipation	625	mW
$R_{\theta JA}$	Thermal Resistance From Junction To Ambient	200	$^{\circ}\text{C}/\text{W}$
$T_j$	Junction Temperature	150	$^{\circ}\text{C}$
$T_{stg}$	Storage Temperature	-55~+150	$^{\circ}\text{C}$

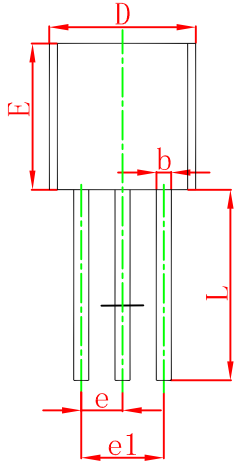
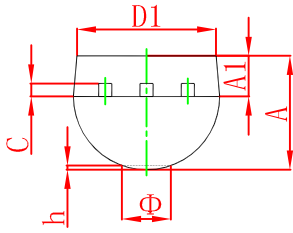
#### ELECTRICAL CHARACTERISTICS ( $T_a=25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Collector-base breakdown voltage	$V_{(BR)CBO}$	$I_C=0.1\text{mA}, I_E=0$	20			V
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C=1\text{mA}, I_B=0$	16			V
Emitter-base breakdown voltage	$V_{(BR)EBO}$	$I_E=0.1\text{mA}, I_C=0$	6			V
Collector cut-off current	$I_{CBO}$	$V_{CB}=16\text{V}, I_E=0$			0.1	$\mu\text{A}$
Emitter cut-off current	$I_{EBO}$	$V_{EB}=6\text{V}, I_C=0$			0.1	$\mu\text{A}$
DC current gain	$h_{FE(1)}$	$V_{CE}=2\text{V}, I_C=100\text{mA}$	135		650	
	$h_{FE(2)}$	$V_{CE}=2\text{V}, I_C=1.5\text{A}$	100			
Collector-emitter saturation voltage	$V_{CE(sat)(1)}$	$I_C=1\text{A}, I_B=10\text{mA}$			0.4	V
	$V_{CE(sat)(2)}$	$I_C=1.5\text{A}, I_B=20\text{mA}$			0.5	V
	$V_{CE(sat)(3)}$	$I_C=1.5\text{A}, I_B=75\text{mA}$			0.5	V
Base-emitter saturation voltage	$V_{BE(sat)}$	$I_C=1.5\text{mA}, I_B=75\text{mA}$			1.2	V
Base-emitter voltage	$V_{BE}$	$V_{CE}=6\text{V}, I_C=5\text{mA}$	0.55		0.65	V
Collector output capacitance	$C_{ob}$	$V_{CB}=10\text{V}, I_E=0, f=1\text{MHz}$		28		pF
Transition frequency	$f_T$	$V_{CE}=10\text{V}, I_C=50\text{mA}$	100			MHz

#### CLASSIFICATION OF $h_{FE(1)}$

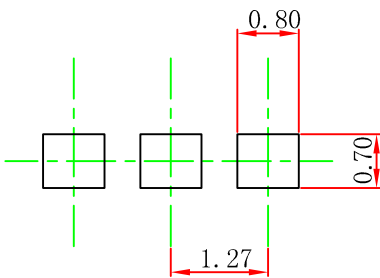
RANK	L	K	U
RANGE	135-270	200-400	300-650

## 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

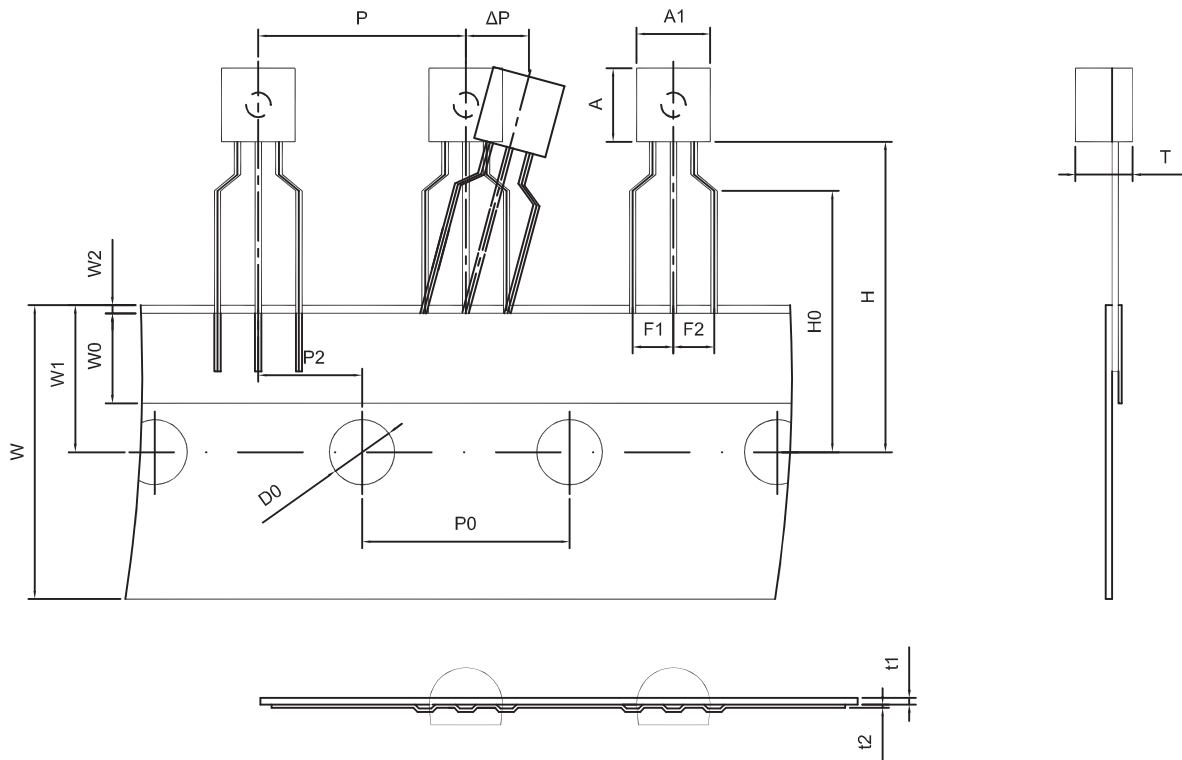
## TO-92 Suggested Pad Layout



### Note:

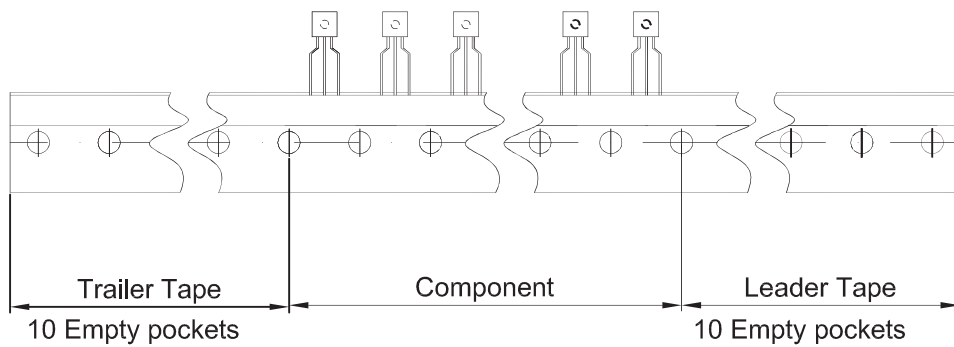
1. Controlling dimension: in millimeters.
2. General tolerance:  $\pm 0.05$ mm.
3. The pad layout is for reference purposes only.

TO-92 PACKAGE TAPEING DIMENSION



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