

TO-92 Plastic-Encapsulate Transistors

3DD13002S TRANSISTOR (NPN)

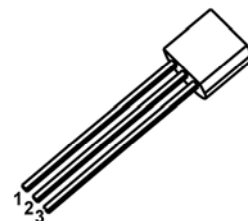
FEATURES

Power switching applications

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

Symbol	Parameter	Value	Unit
V_{CBO}	Collector-Base Voltage	600	V
V_{CEO}	Collector-Emitter Voltage	400	V
V_{EBO}	Emitter-Base Voltage	6	V
I_C	Collector Current -Continuous	1	A
P_C	Collector Power Dissipation	0.75	W
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	167	$^{\circ}\text{C}/\text{W}$
T_J	Junction Temperature	150	$^{\circ}\text{C}$
T_{stg}	Storage Temperature	-55~+150	$^{\circ}\text{C}$

TO-92



- 1. EMITTER
- 2. COLLECTOR
- 3. BASE

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

Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Collector-base breakdown voltage	$V_{(BR)CBO}$	$I_C = 0.1\text{mA}, I_E = 0$	600			V
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = 1\text{mA}, I_B = 0$	400			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}	$V_{CB} = 600\text{V}, I_E = 0$			100	μA
Collector cut-off current	I_{CEO}	$V_{CE} = 400\text{V}, I_B = 0$			100	μA
Emitter cut-off current	I_{EBO}	$V_{EB} = 7\text{V}, I_C = 0$			100	μA
DC current gain	$h_{FE(1)}$	$V_{CE} = 10\text{V}, I_C = 200\text{mA}$	9		40	
	$h_{FE(2)}$	$V_{CE} = 10\text{V}, I_C = 250\mu\text{A}$	5			
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = 200\text{mA}, I_B = 40\text{mA}$			0.5	V
Base-emitter saturation voltage	$V_{BE(sat)}$	$I_C = 200\text{mA}, I_B = 40\text{mA}$			1.1	V
Transition frequency	f_T	$V_{CE} = 10\text{V}, I_C = 100\text{mA}, f = 1\text{MHz}$	5			MHz
Fall time	t_f	$I_C = 1\text{A}, I_{B1} = I_{B2} = 0.2\text{A}, V_{CC} = 100\text{V}$			0.5	μs
Storage time	t_S	$I_C = 1\text{A}, I_{B1} = I_{B2} = 0.2\text{A}, V_{CC} = 100\text{V}$			2.5	μs

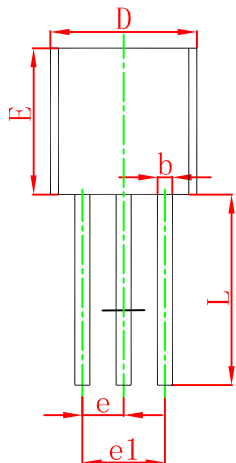
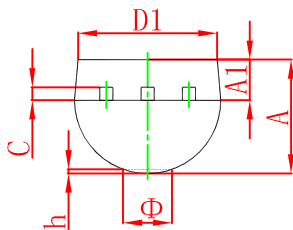
CLASSIFICATION of $h_{FE(1)}$

Range	9-15	15-20	20-25	25-30	30-35	35-40
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CLASSIFICATION of $V_{CE(sat)}$

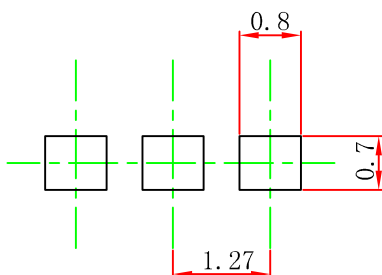
Rank	A	B
Range	<0.25	0.25-0.45

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	4.400	4.700	0.173	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



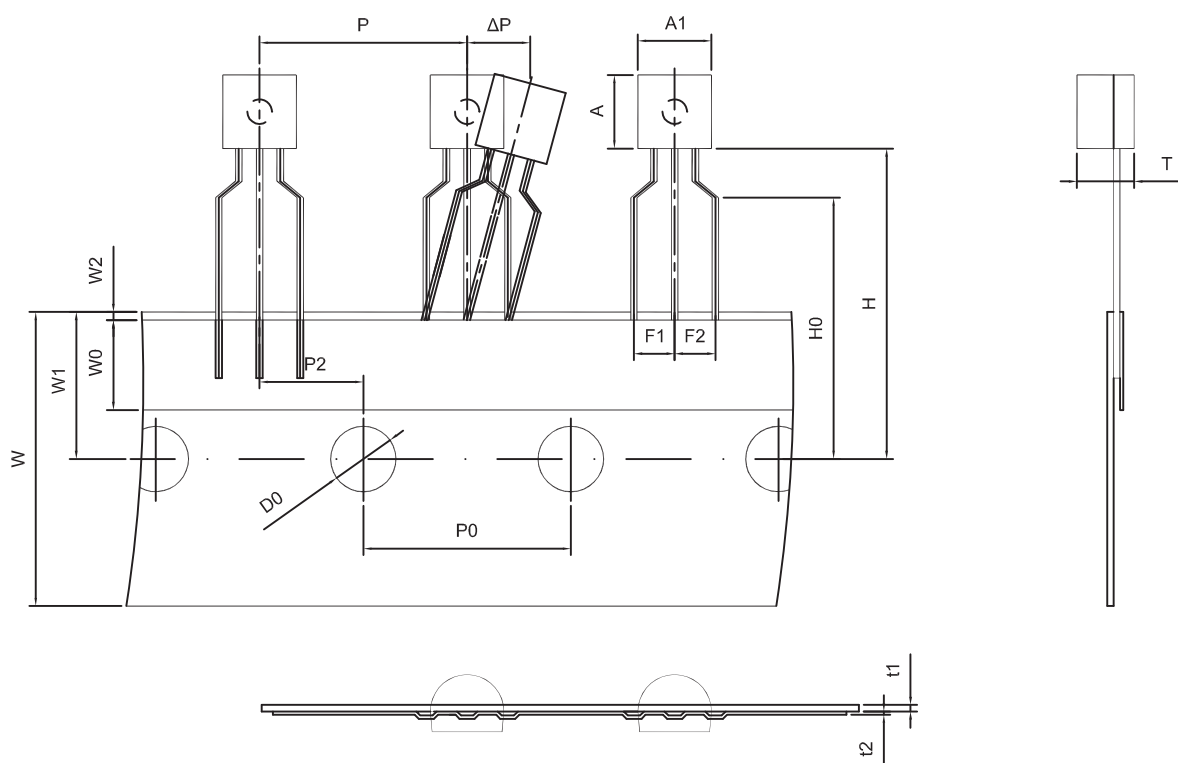
Note:

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

NOTICE

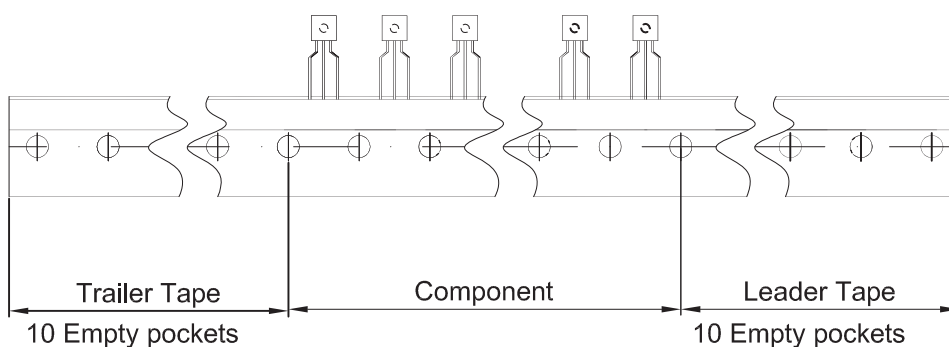
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TO-92 PACKAGE TAPEING DIMENSION



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