

TO-92 Plastic Package

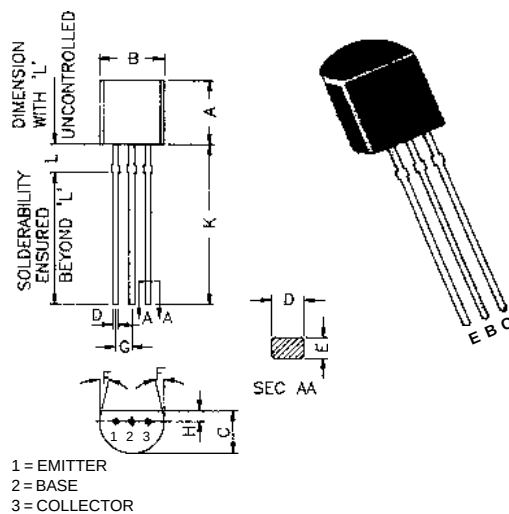
2N4400, 2N4401

2N4402, 2N4403

2N4400, 4401 NPN SILICON PLANAREPITAXIAL TRANSISTORS

2N4402, 4403 PNP SILICON PLANAREPITAXIAL TRANSISTORS

General Purpose Switching Applications



DIM	MIN	MAX
A	4,32	5,33
B	4,45	5,20
C	3,18	4,19
D	0,41	0,55
E	0,35	0,50
F	5 DEG	
G	1,14	1,40
H	1,14	1,53
K	12,70	—
L	1.982	2.082

ALL DIMENSIONS IN M.M.

ABSOLUTE MAXIMM RATINGS

Rating	Symbol	2N4400/01	2N4402/03	Units
Collector-Emitter Voltage	V_{CEO}	40	40	V
Collector-Base Voltage	V_{CBO}	60	40	V
Emitter-Base Voltage	V_{EBO}	6	5	V
Collector Current Continuous	I_C	-	600	- mA
Power Dissipation At $T_a=25^\circ\text{C}$	P_D	-	625	- mW
Derate Above 25°C		-	5.0	- mW/ $^\circ\text{C}$
Power Dissipation At $T_c=25^\circ\text{C}$	P_D	-	1.5	- W
Derate Above 25°C		-	12	- mW/ $^\circ\text{C}$
Operating & Storage	T_j, T_{stg}	-55 to +150		$^\circ\text{C}$
Junction Temperature Range				

THERMAL RESISTANCE

Junction to Case	$R_{th(j-c)}$	-	83.3	-	$^\circ\text{C}/\text{W}$
Junction to Ambient	$R_{th(j-a)}$	-	200	-	$^\circ\text{C}/\text{W}$

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

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2N4402, 2N4403

Characteristic	Symbol	2N4400/01	2N4402/03	Unit
<i>Collector Emitter Voltage</i>				
$I_C=1mA, I_B=0$	BV_{CEO}^*	>40	>40	V
<i>Collector Base Voltage</i>				
$I_C=100\mu A, I_E=0$	BV_{CBO}	>60	>40	V
<i>Emitter Base Voltage</i>				
$I_E=100\mu A, I_C=0$	BV_{EBO}	>6	>5	V
<i>Base Cutoff Current</i>				
$V_{CE}=35V, V_{BE}=0.4V$	I_{BEV}	<0.1	<0.1	μA
<i>Collector Cutoff Current</i>				
$V_{CE}=35V, V_{BE}=0.4V$	I_{CEX}	<0.1	<0.1	μA
<i>Collector-Emitter Saturation Voltage</i>				
$I_C=150mA, I_B=15mA$	$V_{CE(sat)}^*$	<0.4	<0.4	V
$I_C=500mA, I_B=50mA$		<0.75	<0.75	V
<i>Base-Emitter Saturation Voltage</i>				
$I_C=150mA, I_B=15mA$	$V_{BE(sat)}^*$	0.75 to 0.95	0.75 to 0.95	V
$I_C=500mA, I_B=50mA$		<1.2	<1.3	V

Characteristic	Symbol	2N4400	2N4401	2N4402	2N4403	Unit
<i>D C Current Gain</i>						
$I_C=0.1mA, V_{CE}=1V$	h_{FE}	-	>20	-	>30	
$I_C=1mA, V_{CE}=1V$		>20	>40	>30	>60	
$I_C=10mA, V_{CE}=1V$		>40	>80	>50	>100	
$I_C=150mA, V_{CE}=1V^*$		50-150	100-300	-	-	
$I_C=150mA, V_{CE}=2V^*$		-	-	50-150	100-300	
$I_C=500mA, V_{CE}=2V^*$		>20	>40	>20	>20	
DYNAMIC CHARACTERISTICS						
<i>Small Signal Current Gain</i>						
$I_C=1mA, V_{CE}=10V, f=1KHz$	h_{fe}	20-250	40-500	30-250	60-500	
<i>Input Impedance</i>						
$I_C=1mA, V_{CE}=10V, f=1KHz$	h_{ie}	0.5-7.5	1.0-15	0.75-7.5	1.5-15	K Ω

2N4400, 2N4401
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Characteristic	Symbol	2N4400	2N4401	2N4402	2N4403	Unit
Voltage Feedback Ratio $I_C=1mA, V_{CE}=10V, f=1KHz$	h_{re} ALL			0.1-8.0		$\times 10^{-4}$
Output Admittance $I_C=1mA, V_{CE}=10V, f=1KHz$	h_{oe}	1.0-30	1.0-30	1.0-100	1.0-100	μS
Collector-Base Capacitance $V_{CB}=5V, I_E=0, f=100KHz$	C_{cb}	<6.5	<6.5	-	-	pF
$V_{CB}=10V, I_E=0, f=140KHz$		-	-	<8.5	<8.5	pF
Emitter-Base Capacitance $V_{EB}=0.5V, I_C=0, f=100KHz$	C_{eb}	<30	<30	-	-	pF
$V_{EB}=0.5V, I_C=0, f=140KHz$		-	-	<30	<30	pF
Transition Frequency $I_C=20mA, V_{CE}=10V$ $f=100MHz$	f_T	>200	>250	>150	>200	MHz

SWITCHING CHARACTERISTICS

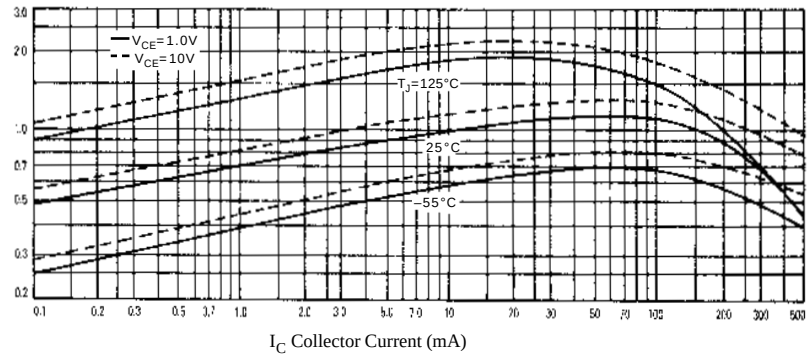
$V_{CC}=30V, V_{EB}=2V,$ $I_C=150mA, I_{B1}=15mA$						
Delay time	t_d ALL			<15		ns
Rise time	t_r ALL			<20		ns
$V_{CC}=30V, I_C=150mA,$ $I_{B1}=I_{B2}=15mA$						
Storage time	t_s ALL			<225		ns
Fall time	t_f ALL			<30		ns

*Pulse Test : Pulse width $\leq 300\mu s$, duty $\leq 2.0\%$.

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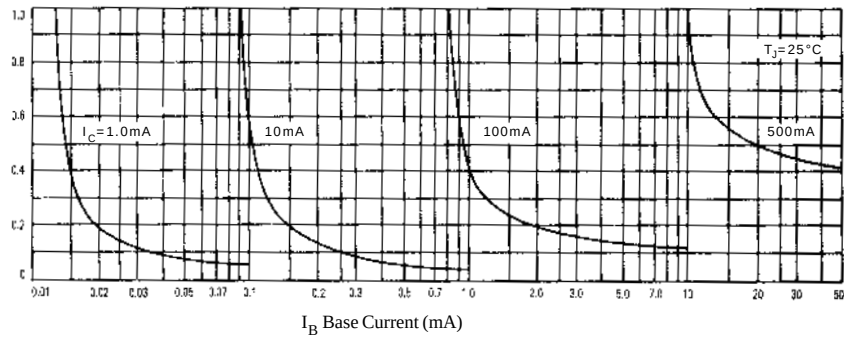
DC Current Gain

h_{FE} DC Current Gain (Normalized)

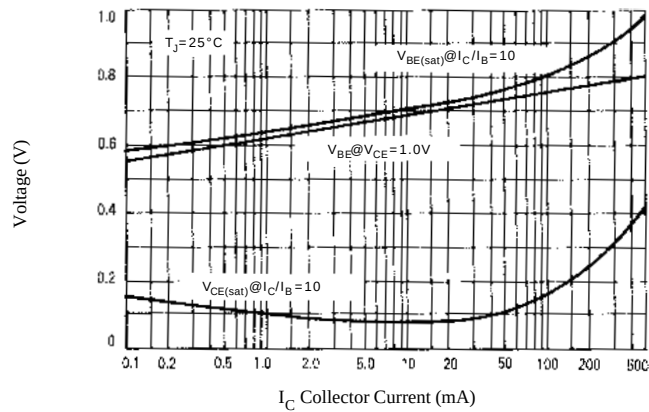


DC Current Gain

V_{CE} Collector-Emitter Voltage (V)

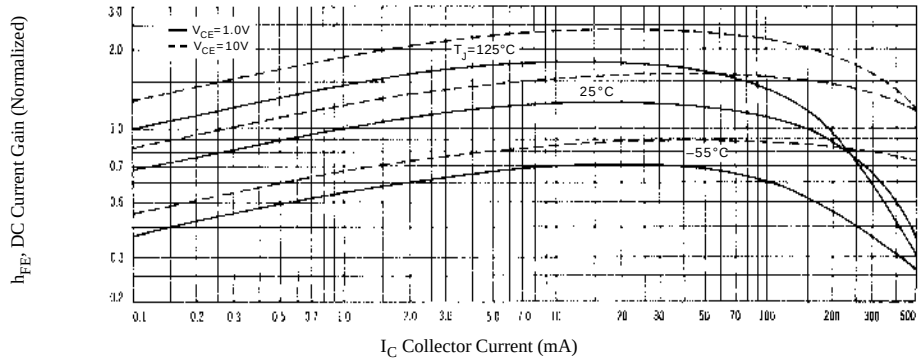


On Voltages

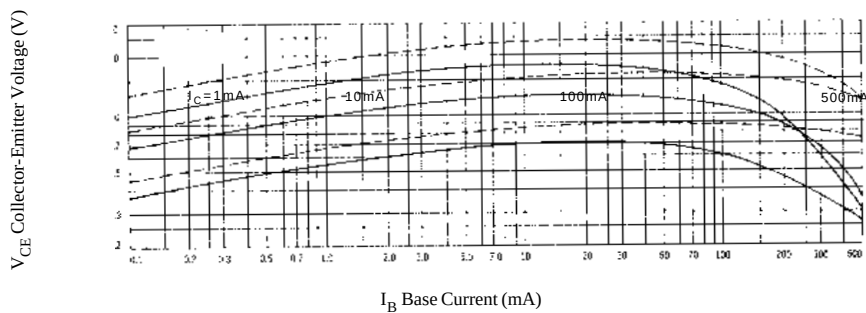


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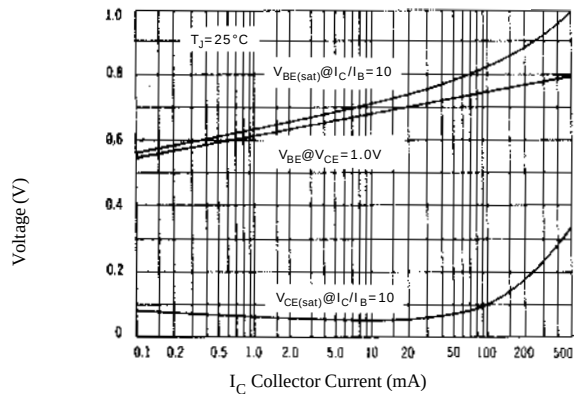
DC Current Gain



Collector Saturation Region



On Voltages



Notes

Disclaimer

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