SILICON PLANAR EPITAXIAL TRANSISTORS

N-P-N silicon planar epitaxial transistors in plastic TO-92 package for use in general purpose applications.

QUICK REFERENCE DATA

			2N4400	2N4401	
Collector-emitter voltage (open base)	V_{CEO}	max.	40		V
Collector-base voltage (open emitter)	V_{CBO}	max.	60		V
Collector current (d.c.)	I_C	max.	600		mA
Total device dissipation at T_{amb} = 25 °C	P_{tot}	max.	625		mW
Collector-emitter saturation voltage I_C = 500 mA; I_B = 50 mA	V_{CEsat}	max.	0,75		V
D.C. current gain I_C = 100 mA; V_{CE} = 2 V	h_{FE}	min.	50	150	
		max.	100	300	

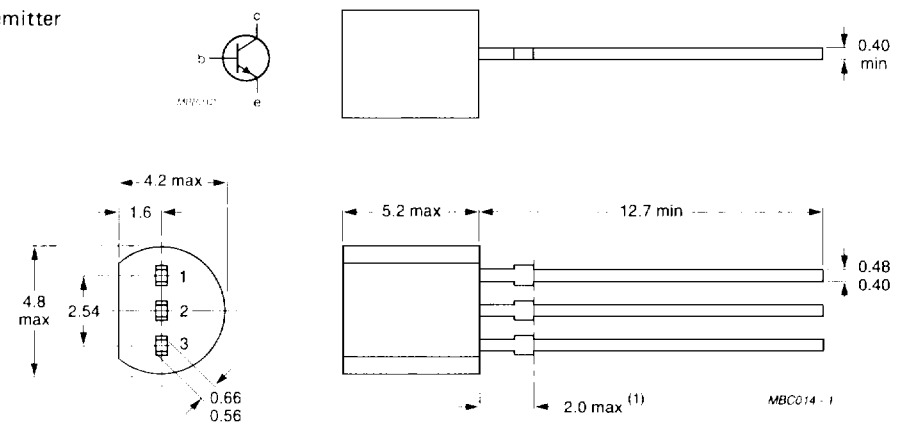
MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-92.

Pinning

1 = collector
2 = base
3 = emitter



Note (1) Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

			2N4400	2N4401	
Collector-emitter voltage (open base)	V_{CEO}	max.	40		V
Collector-base voltage (open emitter)	V_{CBO}	max.	60		V
Emitter-base voltage (open collector)	V_{EBO}	max.	6		V
Collector current (d.c.)	I_C	max.	600		mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	625		mW
Storage temperature range	T_{stg}		−65 to +150		°C
Junction temperature	T_j	max.	150		°C

THERMAL RESISTANCE

From junction to ambient	$R_{th\ j\text{-}a}$	=	200		K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage I_B = 0; I_C = 1 mA	$V_{(BR)CEO}$	min.	40		V
Collector-base breakdown voltage I_E = 0; I_C = 0,1 mA	$V_{(BR)CBO}$	min.	60		V
Emitter-base breakdown voltage I_E = 0,1 mA; I_C = 0	$V_{(BR)EBO}$	min.	6		V
Base cut-off current V_{CE} = 35 V; $-V_{BE}$ = 0,4 V	I_{BEX}	max.	0,1		μA
Collector cut-off current V_{CE} = 35 V; $-V_{BE}$ = 0,4 V	I_{CEX}	max.	0,1		μA
D.C. current gain					
I_C = 0,1 mA; V_{CE} = 1 V	h_{FE}	min.	20		
I_C = 1 mA; V_{CE} = 1 V	h_{FE}	min.	20	40	
I_C = 10 mA; V_{CE} = 1 V	h_{FE}	min.	40	80	
I_C = 150 mA; V_{CE} = 1 V	h_{FE}	min.	50	100	
		max.	150	300	
I_C = 500 mA; V_{CE} = 2 V	h_{FE}	min.	20	40	
Saturation voltages					
I_C = 150 mA; I_B = 15 mA	V_{CEsat}	max.	0,4		V
	V_{BEsat}	min.	0,75		V
		max.	0,95		V
I_C = 500 mA; I_B = 50 mA	V_{CEsat}	max.	0,75		V
	V_{BEsat}	max.	1,2		V

			2N4400	2N4401	
Transition frequency at f = 100 MHz I_C = 20 mA; V_{CE} = 10 V	f_T	min.	200	250	MHz
Collector-base capacitance I_E = 0; V_{CB} = 5 V; f = 100 kHz	C_c	max.	6,5		pF
Emitter-base capacitance I_C = 0; V_{BE} = 0,5 V; f = 100 kHz	C_e	max.	30		pF
Input impedance at f = 1 kHz I_C = 1 mA; V_{CE} = 10 V	h_{ie}	min. max.	0,5 7,5	1,0 15	kΩ kΩ
Voltage feedback ratio at f = 1 kHz I_C = 1 mA; V_{CE} = 10 V	h_{re}	min. max.	0,1 8,0		$\times 10^{-4}$ $\times 10^{-4}$
Small-signal current gain I_C = 1 mA; V_{CE} = 10 V; f = 1 kHz	h_{fe}	min. max.	20 250	40 500	
Output admittance at f = 1 kHz I_C = 1 mA; V_{CE} = 10 V	h_{oe}	min. max.	1,0 30		μS μS
Switching times (resistive load)					
Turn-on time I_C = 150 mA; I_{B1} = 15 mA; V_{CC} = 30 V; V_{EB} = 2 V					
delay time	t_d	max.	15		ns
rise time	t_r	max.	20		ns
Turn-off time I_C = 150 mA; I_{B1} = I_{B2} = 15 mA; V_{CC} = 30 V					
storage time	t_s	max.	225		ns
fall time	t_f	max.	30		ns