T-37-15

SILICON PLANAR EPITAXIAL TRANSISTORS

P-N-P transistors in plastic TO-92 envelopes, primarily intended for high-speed, saturated switching applications for industrial service.

N-P-N complements are 2N3903 and 2N3904.

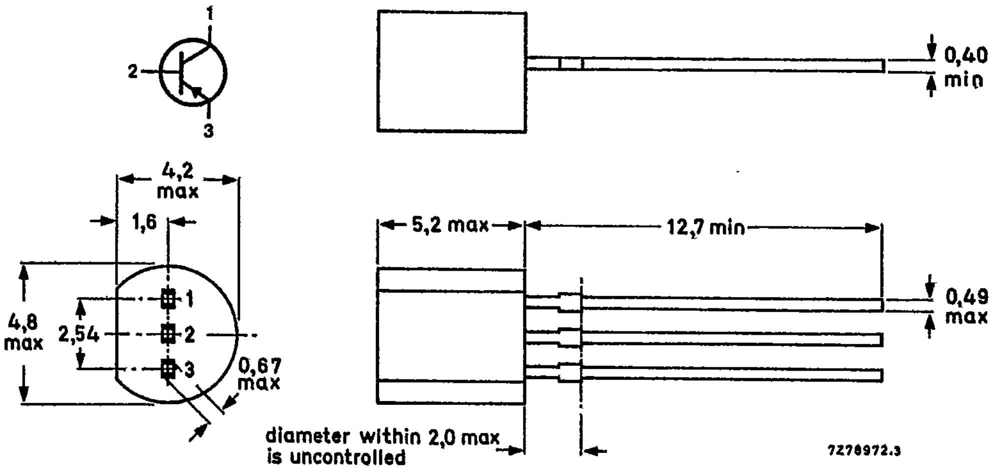
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	40		V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	40		V
Collector current (d.c.)	$-I_C$	max.	200		mA
Total power dissipation at $T_{amb} = 25\ ^oC$	P_{tot}	max.	350		mW
Junction temperature	T_j	max.	150		^oC
			2N3905	2N3906	
D.C. current gain $-I_C = 10$ mA; $-V_{CE} = 1$ V	h_{FE}	$>$ $<$	50 150	100 300	
Transition frequency at f = 100 MHz $-I_C = 10$ mA; $-V_{CE} = 20$ V	f_T	$>$	200	250	MHz
Storage time $-I_{Con} = 10$ mA; $-I_{Bon} = I_{Boff} = 1$ mA	t_s	$<$	200	225	ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-92.



RATINGS

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

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	40	V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	40	V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	5	V
Collector current (d.c.)	$-I_C$	max.	200	mA
Total power dissipation at $T_{amb} = 25\ ^oC$	P_{tot}	max.	350	mW
Storage temperature	T_{stg}		−65 to +150	^oC
Junction temperature	T_j	max.	150	^oC

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	357	K/W

CHARACTERISTICS

$T_{amb} = 25\ ^oC$

Currents at reverse biased emitter junction $-V_{CE} = 30$ V; $+V_{BE} = 3$ V	$-I_{CEX}$ $+I_{BEX}$	$<$ $<$	50 50	nA nA
Saturation voltages * $-I_C = 10$ mA; $-I_B = 1$ mA	$-V_{CEsat}$ $-V_{BEsat}$	$<$	250 650 to 850	mV mV
$-I_C = 50$ mA; $-I_B = 5$ mA	$-V_{CEsat}$ $-V_{BEsat}$	$<$ $<$	400 950	mV mV

			2N3905	2N3906	
D.C. current gain *					
$-I_C = 0{,}1$ mA; $V_{CE} = 1$ V	h_{FE}	$>$	30	60	
$-I_C = 1$ mA; $V_{CE} = 1$ V	h_{FE}	$>$	40	80	
$-I_C = 10$ mA; $V_{CE} = 1$ V	h_{FE}	$>$ $<$	50 150	100 300	
$-I_C = 50$ mA; $V_{CE} = 1$ V	h_{FE}	$>$	30	60	
$-I_C = 100$ mA; $V_{CE} = 1$ V	h_{FE}	$>$	15	30	
Collector capacitance at 100 kHz $\leqslant f \leqslant$ 1 MHz $I_E = I_e = 0$; $-V_{CB} = 5$ V	C_c	$<$	4,5	4,5	pF
Emitter capacitance at 100 kHz $\leqslant f \leqslant$ 1 MHz $I_C = I_c = 0$; $-V_{EB} = 0{,}5$ V	C_e	$<$	10	10	pF
Transition frequency at f = 100 MHz $-I_C = 10$ mA; $-V_{CE} = 20$ V	f_T	$>$	200	250	MHz
Noise figure at $R_S = 1\ k\Omega$ $-I_C = 100\ \mu A$; $-V_{CE} = 5$ V f = 10 Hz to 15,7 kHz	F	$<$	5	4	dB

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* Measured under pulse conditions: $t_p = 300\ \mu s$; $\delta = 0{,}02$.

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h-parameters (common emitter)
$-I_C = 1$ mA; $-V_{CE} = 10$ V; f = 1 kHz

		2N3905	2N3906	
Input impedance	h_{ie}	0,5 to 8	2 to 12	kΩ
Reverse voltage transfer ratio	h_{re}	0,1 to 5	0,1 to 10	10^{-4}
Small-signal current gain	h_{fe}	50 to 200	100 to 400	
Output admittance	h_{oe}	1 to 40	3 to 60	μS

Switching times

Turn-on time (see Figs 2 and 3) when switched from
$+V_{BEoff} = 0{,}5$ V to $-I_{Con} = 10$ mA; $-I_{Bon} = 1$ mA

		2N3905	2N3906	
Delay time	t_d	< 35	35	ns
Rise time	t_r	< 35	35	ns

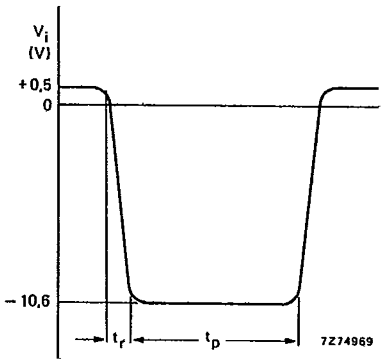


Fig. 2 Input waveform; $t_r < 1$ ns; $t_p = 300$ ns; $\delta = 0{,}02$.

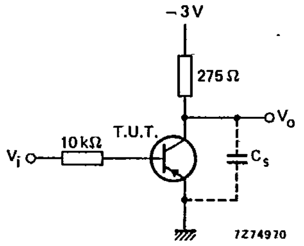


Fig. 3 Delay and rise time test circuit; total shunt capacitance of test jig and connectors $C_s < 4$ pF; scope impedance = 10 MΩ.

Turn-off time (see Figs 4 and 5)
$-I_{Con} = 10$ mA; $-I_{Bon} = I_{Boff} = 1$ mA

		2N3905	2N3906	
Storage time	t_s	< 200	225	ns
Fall time	t_f	< 60	75	ns

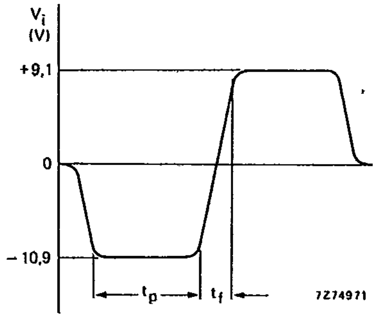


Fig. 4 Input waveform; $t_f < 1$ ns; $10\ \mu s < t_p < 500\ \mu s$; $\delta = 0{,}02$.

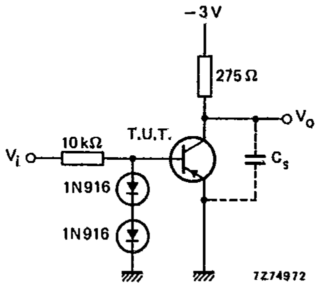


Fig. 5 Storage and fall time test circuit; total shunt capacitance of test jig and connectors $C_s < 4$ pF; scope impedance = 10 MΩ.

T-31-25

N-CHANNEL JUNCTION FIELD-EFFECT TRANSISTOR

Symmetrical n-channel, depletion type, silicon planar epitaxial junction field-effect transistor in a TO-72 metal envelope, intended for v.h.f. amplifier and mixer applications in industrial service.

QUICK REFERENCE DATA

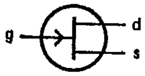
Drain-source voltage	$\pm V_{DS}$	max.	30 V
Gate-source voltage	$-V_{GS}$	max.	30 V
Total power dissipation up to $T_{amb} = 25\ ^{o}C$	P_{tot}	max.	300 mW
Drain current $V_{DS} = 15$ V; $V_{GS} = 0$	I_{DSS}		4 to 20 mA
Feedback capacitance at f = 1 MHz $V_{DS} = 15$ V; $V_{GS} = 0$	C_{rss}	<	2 pF
Transfer admittance (common source) $V_{DS} = 15$ V; $V_{GS} = 0$; f = 200 MHz	$\lvert y_{fs} \rvert$	>	3,2 mS
Noise figure at f = 100 MHz $V_{DS} = 15$ V; $V_{GS} = 0$; $R_G = 1\ k\Omega$	F	<	2,5 dB

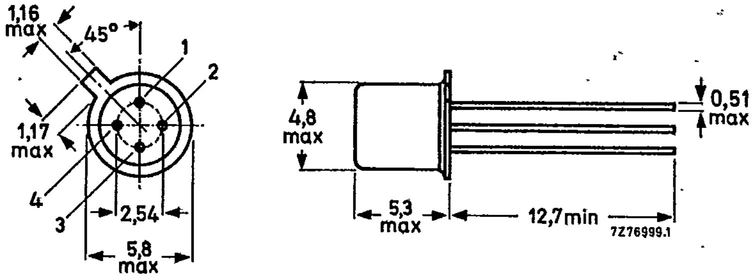
MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72.

Pinning
1 = source
2 = drain
3 = gate
4 = shield lead
connected to
case





Note: Drain and source are interchangeable.

Accessories: 56246 (distance disc).