Jameco Part Number 38279TI

TYPES 2N2904 THRU 2N2907, 2N2904A THRU 2N2907A
P-N-P SILICON TRANSISTORS

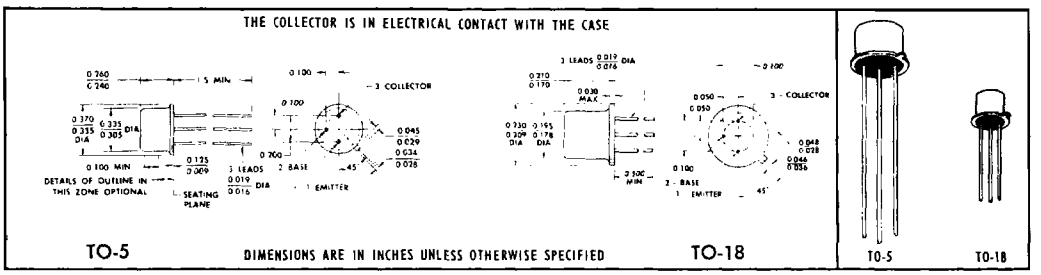
BULLETIN NO. DL-S 7311915, MARCH 1973

DESIGNED FOR HIGH-SPEED, MEDIUM-POWER SWITCHING AND GENERAL PURPOSE AMPLIFIER APPLICATIONS

- High Breakdown Voltage Combined with Very Low Saturation Voltage
- h_{FE} Guaranteed from 100 μA to 500 mA
- 2N2904, 2N2906 for Complementary Use with 2N2218, 2N2221
- 2N2905, 2N2907 for Complementary Use with 2N2219, 2N2222

*mechanical data

Device types 2N2904, 2N2904A, 2N2905, and 2N2905A are in JEDEC TO-5 packages.
Device types 2N2906, 2N2906A, 2N2907, and 2N2907A are in JEDEC TO-18 packages.



*absolute maximum ratings at 25°C free-air temperature (unless otherwise noted)

	2N2904 2N2905	2N2904A 2N2905A	2N2906 2N2907	2N2906A 2N2907A	UNIT
Collector-Base Voltage	−60	−60	−60	−60	V
Collector-Emitter Voltage (See Note 1)	−40	−60	−40	−60	V
Emitter-Base Voltage	−5	−5	−5	−5	V
Continuous Collector Current	−0.6	−0.6	−0.6	−0.6	A
Continuous Device Dissipation at (or below) 25°C Free-Air Temperature (See Notes 2 and 3)	0.6	0.6	0.4	0.4	W
Continuous Device Dissipation at (or below) 25°C Case Temperature (See Notes 4 and 5)	3	3	1.8	1.8	W
Storage Temperature Range	−65 to 200				°C
Lead Temperature 1/16 Inch from Case for 10 Seconds	230				°C

NOTES: 1. These values apply between 0 and 100 mA collector current when the base-emitter diode is open-circuited.
2. Derate 2N2904, 2N2904A, 2N2905, and 2N2905A linearly to 200°C free-air temperature at the rate of 3.43 mW/°C.
3. Derate 2N2906, 2N2906A, 2N2907, and 2N2907A linearly to 200°C free-air temperature at the rate of 2.28 mW/°C.
4. Derate 2N2904, 2N2904A, 2N2905, and 2N2905A linearly to 200°C case temperature at the rate of 17.3 mW/°C.
5. Derate 2N2906, 2N2906A, 2N2907, and 2N2907A linearly to 200°C case temperature at the rate of 10.3 mW/°C.

*JEDEC registered data. This data sheet contains all applicable registered data in effect at the time of publication.

USES CHIP P20

*electrical characteristics at 25°C free-air temperature (unless otherwise noted)

PARAMETER		TEST CONDITIONS	TO-5→ / TO-18→	2N2904 / 2N2906		2N2904A / 2N2906A		2N2905 / 2N2907		2N2905A / 2N2907A		UNIT
				MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = -10\ \mu A$, $I_E = 0$		−60		−60		−60		−60		V
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C = -10$ mA, $I_B = 0$, See Note 6		−40		−60		−40		−60		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = -10\ \mu A$, $I_C = 0$		−5		−5		−5		−5		V
I_{CBO}	Collector Cutoff Current	$V_{CB} = -50$ V, $I_E = 0$			−20		−10		−20		−10	nA
		$V_{CB} = -50$ V, $I_E = 0$, $T_A = 150°C$			−20		−10		−20		−10	μA
I_{CEV}	Collector Cutoff Current	$V_{CE} = -30$ V, $V_{BE} = 0.5$ V			−50		−50		−50		−50	nA
I_{BEV}	Base Cutoff Current	$V_{CE} = -30$ V, $V_{BE} = 0.5$ V			50		50		50		50	nA
h_{FE}	Static Forward Current Transfer Ratio	$V_{CE} = -10$ V, $I_C = -100\ \mu A$		20		40		35		75		
		$V_{CE} = -10$ V, $I_C = -1$ mA		25		40		50		100		
		$V_{CE} = -10$ V, $I_C = -10$ mA		35		40		75		100		
		$V_{CE} = -10$ V, $I_C = -150$ mA, See Note 6		40	120	40	120	100	300	100	300	
		$V_{CE} = -10$ V, $I_C = -500$ mA, See Note 6		20		40		30		50		
V_{BE}	Base-Emitter Voltage	$I_B = -15$ mA, $I_C = -150$ mA, See Note 6			−1.3		−1.3		−1.3		−1.3	V
		$I_B = -50$ mA, $I_C = -500$ mA, See Note 6			−2.6		−2.6		−2.6		−2.6	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_B = -15$ mA, $I_C = -150$ mA, See Note 6			−0.4		−0.4		−0.4		−0.4	V
		$I_B = -50$ mA, $I_C = -500$ mA, See Note 6			−1.6		−1.6		−1.6		−1.6	
$\lvert h_{fe} \rvert$	Small-Signal Common-Emitter Forward Current Transfer Ratio	$V_{CE} = -20$ V, $I_C = -50$ mA, f = 100 MHz		2		2		2		2		
C_{obo}	Common-Base Open-Circuit Output Capacitance	$V_{CB} = -10$ V, $I_E = 0$, f = 100 kHz			8		8		8		8	pF
C_{ibo}	Common-Base Open-Circuit Input Capacitance	$V_{EB} = -2$ V, $I_C = 0$, f = 100 kHz			30		30		30		30	pF

NOTE 6: These parameters must be measured using pulse techniques. $t_w = 300\ \mu s$, duty cycle ⩽ 2%.
*JEDEC registered data

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*switching characteristics at 25°C free-air temperature

PARAMETER		TEST CONDITIONS†	MAX	UNIT
t_d	Delay Time	V_{CC} = −30 V, I_C = −150 mA, $I_{B(1)}$ = −15 mA, $V_{BE(off)}$ = 0, See Figure 1	10	ns
t_r	Rise Time		40	ns
t_{on}	Turn-On Time		45	ns
t_s	Storage Time	V_{CC} = −6 V, I_C = −150 mA, $I_{B(1)}$ = −13 mA, $I_{B(2)}$ = 17 mA, See Figure 2	80	ns
t_f	Fall Time		30	ns
t_{off}	Turn-Off Time		100	ns

†Voltage and current values shown are nominal; exact values vary slightly with transistor parameters.

*PARAMETER MEASUREMENT INFORMATION

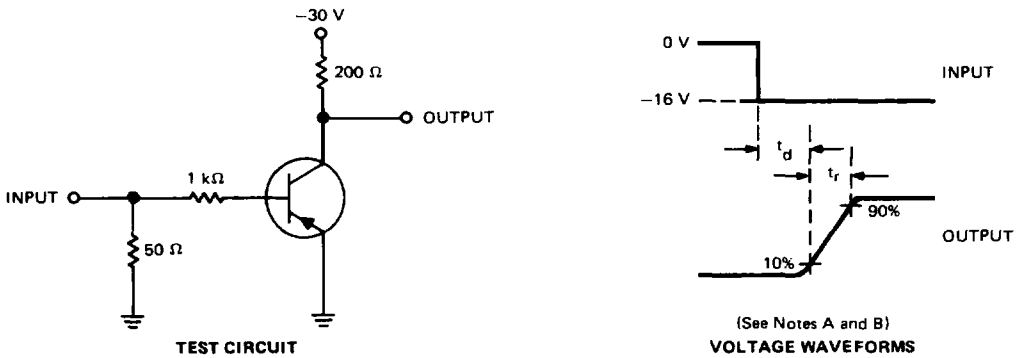

FIGURE 1

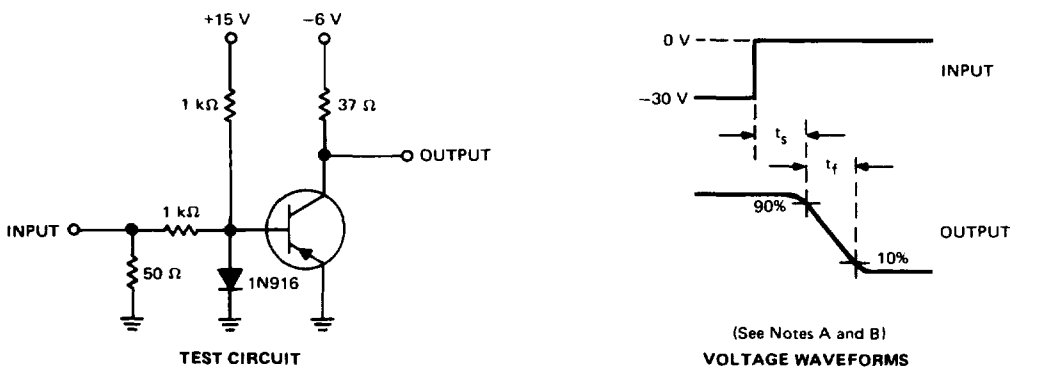

FIGURE 2

NOTES: A. The input waveforms are supplied by a generator with the following characteristics: Z_{out} = 50 Ω, $t_r \leq 2$ ns, $t_f \leq 2$ ns, t_w = 200 ns, PRR = 150 Hz.

B. Waveforms are monitored on an oscilloscope with the following characteristics: $t_r \leq 5$ ns, R_{in} = 10 MΩ.

*JEDEC registered data

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