FM870 · 2N1889 · 2N870
FM871 · 2N1890 · 2N871

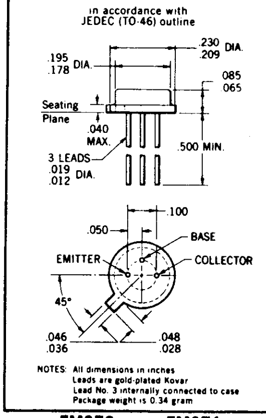
NPN HIGH VOLTAGE AMPLIFIER AND OSCILATOR TYPE

DIFFUSED SILICON PLANAR * TRANSISTORS

GENERAL DESCRIPTION — These transistors are designed for high voltage large signal amplifier and oscillator applications where PLANAR* reliability and performance are desired.

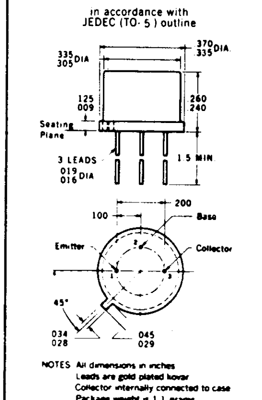
Low leakage (typically 50 nanoamperes at 100°C and 75 volts) together with nearly constant current gain over more than four decades substantially improves linearity in large signal high voltage applications such as servo motor drivers and some operational amplifiers. A typical gain bandwidth of 90 megahertz and low capacitance permit improved performance in high frequency circuits such as electrostatic deflection amplifiers for CRT's and high level video amplifiers.

PHYSICAL DIMENSIONS in accordance with JEDEC (TO-46) outline



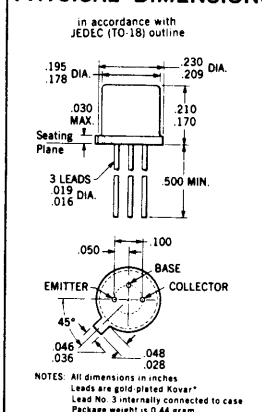
FM870 • FM871

PHYSICAL DIMENSIONS in accordance with JEDEC (TO-5) outline



2N1889 • 2N1890

PHYSICAL DIMENSIONS in accordance with JEDEC (TO-18) outline



2N870 • 2N871

ABSOLUTE MAXIMUM RATINGS [Note 1]

		FM870 FM871	2N1889 2N1890	2N870 2N871
Maximum Temperatures				
Storage Temperature		−65°C to +300°C All Units		
Operating Junction Temperature		200°C Maximum All Units		
Maximum Power Dissipation				
Total Dissipation at 25°C Case Temperature [Note 2 and 3]		4.0 Watts	3.0 Watts	1.8 Watts
at 100°C Case Temperature [Note 2 and 3]		2.3 Watts	1.7 Watts	1.0 Watt
at 25°C Ambient Temperature		0.375 Watt	0.8 Watt	0.5 Watt
Maximum Voltages				
V_{CBO}	Collector to Base Voltage	100 Volts	100 Volts	100 Volts
V_{CER}	Collector to Emitter Voltage ($R_{BE} \leq 10\Omega$)[Note 4]	80 Volts	80 Volts	80 Volts
V_{CEO}	Collector to Emitter Voltage [Note 4]	60 Volts	60 Volts	60 Volts
V_{EBO}	Emitter to Base Voltage	7.0 Volts	7.0 Volts	7.0 Volts

ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N870•FM870 2N1889 MIN.	TYP.	MAX.	2N871•FM871 2N1890 MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS	
h_{FE}	DC Pulse Current Gain [Note 5]	40	75	120	100	130	300		I_C = 150 mA	V_{CE} = 10 V
h_{FE}	DC Pulse Current Gain [Note 5]	35	80			135			I_C = 10 mA	V_{CE} = 10 V
h_{FE} (−55°C)	DC Pulse Current Gain [Note 5]	20	40			65			I_C = 10 mA	V_{CE} = 10 V
h_{FE}	DC Current Gain	20	50			95			I_C = 0.1 mA	V_{CE} = 10 V
V_{BE} (sat)	Base Saturation Voltage		0.8	0.9		0.8	0.9	Volts	I_C = 50 mA	I_B = 5.0 mA
V_{CE} (sat)	Collector Saturation Voltage		0.6	1.2		0.35	1.2	Volts	I_C = 50 mA	I_B = 5.0 mA
V_{BE} (sat)	Base Saturation Voltage		0.9	1.3		0.9	1.3	Volts	I_C = 150 mA	I_B = 15 mA
V_{CE} (sat)	Collector Saturation Voltage		2.5	5.0		1.3	5.0	Volts	I_C = 150 mA	I_B = 15 mA
h_{fe}	High Frequency Current Gain f = 20 MHz	2.5	4.0		3.0	5.0			I_C = 50 mA	V_{CE} = 10 V
C_{obo}	Output Capacitance		13	15		13	15	pF	I_E = 0	V_{CB} = 10 V
C_{TE}	Emitter Transition Capacitance		60	85		60	85	pF	I_C = 0	V_{EB} = 0.5 V
I_{CBO}	Collector Cutoff Current		0.4	10		0.4	10	nA	I_E = 0	V_{CB} = 75 V
I_{CBO} (150°C)	Collector Cutoff Current		1.0	15		1.0	15	μA	I_E = 0	V_{CB} = 75 V
BV_{CBO}	Collector to Base Breakdown Voltage	100			100			Volts	I_C = 0	I_E = 0.1 mA
V_{CER} (sust)	Collector to Emitter Sustaining Voltage [Note 4]	80			80			Volts	I_C = 100 mA (pulsed)	$R_{BE} \leq 10\,\Omega$
V_{CEO} (sust)	Collector to Emitter Sustaining Voltage [Note 4]	60			60			Volts	I_C = 30 mA (pulsed)	I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	7.0			7.0			Volts	I_C = 0	I_E = 0.1 mA
I_{EBO}	Emitter Cutoff Current		0.1	10		0.1	10	nA	I_C = 0	V_{EB} = 5.0 V

* Planar is a patented Fairchild process.

NOTES:

(1) These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.
(2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations. See thermal network on page 4 for typical pulse ratings.
(3) These ratings give a maximum junction temperature of 200°C and thermal resistance (junction-to-case) for the FM870 and FM871 of 43.7°C/watt (derating factor of 22.9 mW/°C); for the 2N1889 and 2N1890 58.3°C/watt (derating factor of 17.2 mW/°C) and for the 2N870 and 2N871 97.1°C/watt (derating factor of 10.3 mW/°C).
(4) These ratings refer to a high current point where collector-to-emitter voltage is lowest.
(5) Pulse Conditions: length = 300 μs; duty cycle = 1%.

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SMALL SIGNAL CHARACTERISTICS (f = 1 kHz)

SYMBOL	CHARACTERISTIC	FM870•2N1889 2N870 MIN.	TYP.	MAX.	FM871•2N1890 2N871 MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS	
h_{ib}	Input Resistance	20	26.9	30	20	27.5	30	ohms	$I_C = 1.0$ mA	$V_{CB} = 5.0$ V
h_{ib}	Input Resistance	4.0	6.1	8.0	4.0	6.4	8.0	ohms	$I_C = 5.0$ mA	$V_{CB} = 10$ V
h_{ob}	Output Conductance		0.12	0.5		0.15	0.3	μmho	$I_C = 1.0$ mA	$V_{CB} = 5.0$ V
h_{ob}	Output Conductance		0.14	0.5		0.16	0.3	μmho	$I_C = 5.0$ mA	$V_{CB} = 10$ V
h_{rb}	Voltage Feedback Ratio		0.52	1.25		0.92	1.50	$\times 10^{-4}$	$I_C = 1.0$ mA	$V_{CB} = 5.0$ V
h_{rb}	Voltage Feedback Ratio		0.59	1.50		0.84	1.50	$\times 10^{-4}$	$I_C = 5.0$ mA	$V_{CB} = 10$ V
h_{fe}	Small Signal Current Gain	30	72	100	50	125	200		$I_C = 1.0$ mA	$V_{CE} = 5.0$ V
h_{fe}	Small Signal Current Gain	45	80	150	70	149	300		$I_C = 5.0$ mA	$V_{CE} = 10$ V
h_{ie}	Input Resistance		2.3			3.5		kohms	$I_C = 1.0$ mA	$V_{CE} = 5.0$ V
h_{oe}	Output Conductance		9.0			16.5		μmho	$I_C = 1.0$ mA	$V_{CE} = 5.0$ V
h_{re}	Voltage Feedback Ratio		3.0			4.6		$\times 10^{-4}$	$I_C = 1.0$ mA	$V_{CE} = 5.0$ V

2N2351 • 2N2351A

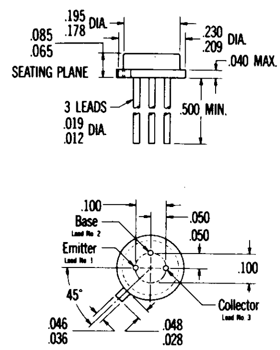
NPN HIGH-SPEED, HIGH-CURRENT SWITCHES

SILICON PLANAR EPITAXIAL TRANSISTORS

FOR IMPROVED PERFORMANCE SEE FAIRCHILD 2N3108, 2N3110

GENERAL DESCRIPTION - The Fairchild 2N2351 and 2N2351A are NPN silicon PLANAR epitaxial transistors designed primarily for use in high speed high current switching applications.

PHYSICAL DIMENSIONS in accordance with JEDEC (TO-46) outline



NOTES: All dimensions in inches. Leads are gold-plated kovar. Collector internally connected to case

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			-65°C to +300°C
Operating Junction Temperature			-65°C to +200°C
Lead Temperature (Soldering, no time limit)			300°C Maximum
Maximum Power Dissipation			
Total Dissipation at 25°C Case Temperature		(Notes 2 and 3)	5.0 Watts
at 100°C Case Temperature		(Notes 2 and 3)	2.85 Watts
at 25°C Ambient Temperature		(Notes 2 and 3)	0.4 Watt
Maximum Voltages and Current			
V_{CBO}	Collector to Base Voltage		80 Volts
V_{CEO}	Collector to Emitter Voltage	(Note 4)	50 Volts
V_{EBO}	Emitter to Base Voltage		8.0 Volts
I_C	Collector Current		1.0 Amp

ELECTRICAL CHARACTERISTICS (25°C free air temperature unless otherwise noted)

Symbol	Characteristic		2N2351 Min.	2N2351 Max.	2N2351A Min.	2N2351A Max.	Units	Test Conditions	
h_{FE}	DC Pulse Current Gain	(Note 5)	40	120	40	120		I_C = 150 mA	V_{CE} = 10 V
h_{FE}	DC Pulse Current Gain	(Note 5)	30		30			I_C = 150 mA	V_{CE} = 1.0 V
h_{FE}	DC Current Gain		30		30			I_C = 10 mA	V_{CE} = 10 V
h_{FE}	DC Pulse Current Gain	(Note 5)	20		20			I_C = 500 mA	V_{CE} = 10 V
h_{FE}(-55°C)	DC Current Gain		20		20			I_C = 10 mA	V_{CE} = 10 V
h_{FE}	DC Pulse Current Gain	(Note 5)	15		15			I_C = 1.0 A	V_{CE} = 10 V
h_{FE}	DC Current Gain		15		15			I_C = 0.1 mA	V_{CE} = 10 V
V_{CE}(sat)	Collector Saturation Voltage			0.35		0.25	Volts	I_C = 150 mA	I_B = 15 mA
V_{BE}(sat)	Base Saturation Voltage			1.3		1.3	Volts	I_C = 150 mA	I_B = 15 mA
h_{fe}	High Frequency Current Gain (f = 20 mc)		2.5		2.5			I_C = 50 mA	V_{CE} = 5.0 V
I_{CBO}	Collector Cutoff Current			10		10	nA	V_{CB} = 60 V	I_E = 0
I_{CBO}(150°C)	Collector Cutoff Current			25		25	μA	V_{CB} = 60 V	I_E = 0
I_{EBO}	Emitter Cutoff Current			50		50	nA	V_{EB} = 5.0 V	I_C = 0
C_{ob}	Output Capacitance (f = 1.0 mc)			20		20	pf	V_{CB} = 10 V	I_E = 0
τ_b	Base Stored Charge			2.1		2.1	μsec	See Figure I	
BV_{CBO}	Collector to Base Breakdown Voltage		80		80		Volts	I_C = 100 μA	I_E = 0
V_{CEO}(sust)	Collector to Emitter Sustaining Voltage	(Notes 4 and 5)	50		50		Volts	I_C = 25 mA (Pulsed)	I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage		8.0		8.0		Volts	I_E = 100 μA	I_C = 0

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NOTES:

(1) These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.

(2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

(3) These ratings give a maximum junction temperature of 200°C and junction-to-case thermal resistance of 35°C/Watt (derating factor of 28.5 mW/°C); junction-to-ambient thermal resistance of 438°C/Watt (derating factor of 2.3 mW/°C).

(4) This rating refers to a high-current point where collector-to-emitter voltage is lowest.

(5) Pulse Conditions: length ≤ 300 μsec; duty cycle ≤ 2%.

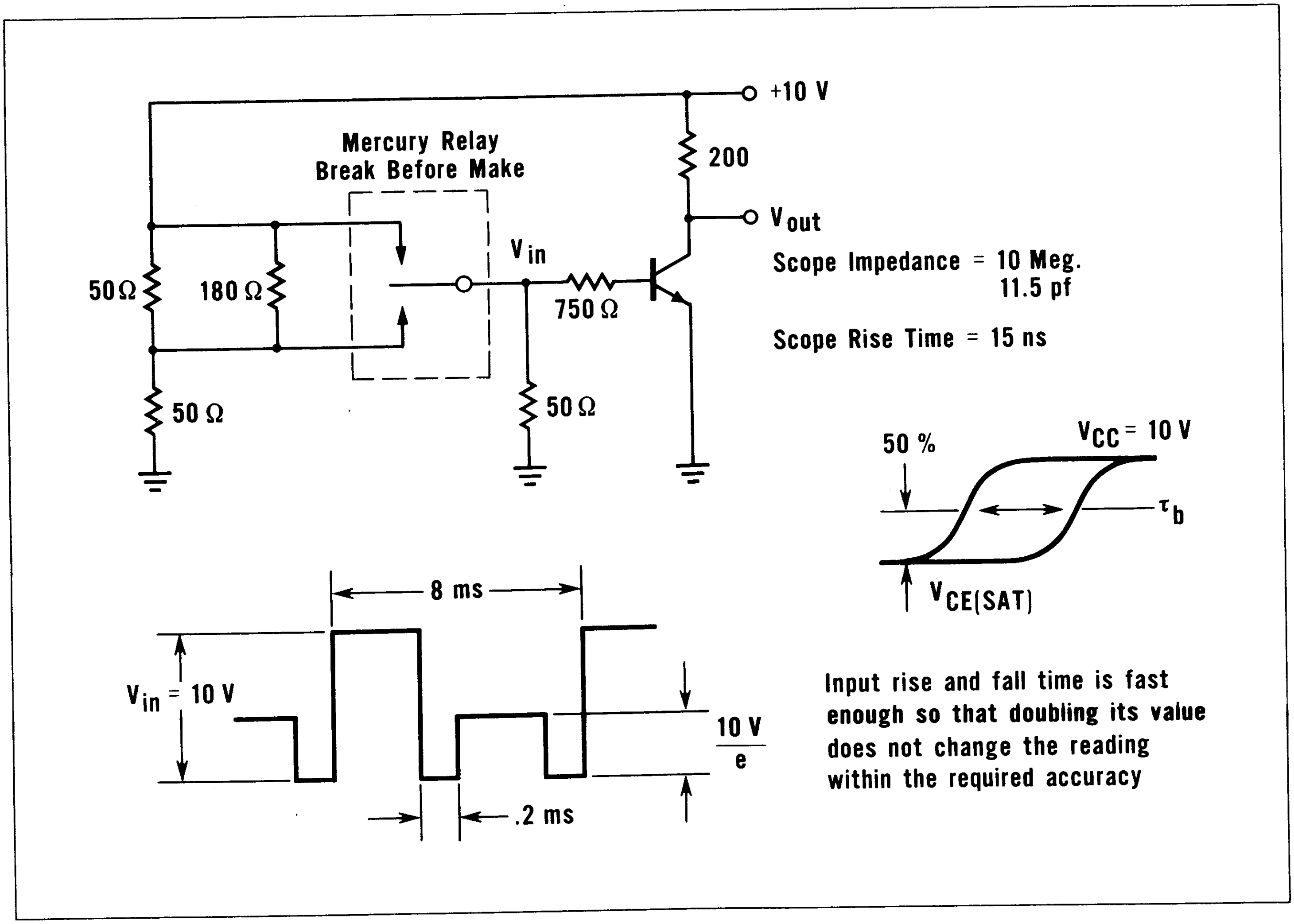


FIGURE 1

2N2443

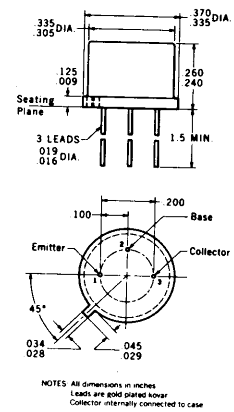
NPN HIGH-VOLTAGE AMPLIFIER AND OSCILLATOR

SILICON PLANAR TRANSISTOR

GENERAL DESCRIPTION The 2N2443 is designed for high-voltage amplifier and oscillator circuits where Planar performance and reliability are essential. A guaranteed LV_{CEO} of 100 volts, BV_{CBO} of 120 volts and 4 watt rating (see below for conditions) permit higher bias voltages and larger voltage swings as encountered in series and shunt regulators for power supplies and in servo amplifiers.

A typical gain-bandwidth product of 80 megacycles and low output capacitance makes this device useful for high-voltage video amplifiers, deflection plate drivers for oscilloscopes and output stages of operational amplifiers.

PHYSICAL DIMENSIONS
in accordance with
JEDEC (TO-5) outline



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures			
Storage Temperature			-65°C to +300°C
Operating Junction Temperature			200°C Maximum
Maximum Power Dissipation			
Total Dissipation	at 25°C Case Temperature	(Notes 2 and 3)	4.0 Watts
	at 100°C Case Temperature	(Notes 2 and 3)	2.28 Watts
	at 25°C Ambient Temperature		0.8 Watt
Maximum Voltages			
V_{CBO}	Collector to Base Voltage		120 Volts
V_{CEO}	Collector to Emitter Voltage	(Note 4)	100 Volts
V_{EBO}	Emitter to Base Voltage		7.0 Volts

ELECTRICAL CHARACTERISTICS (25°C Free Air Temperature unless otherwise noted)

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Conditions
h_{FE}	DC Pulse Current Gain (Note 5)	50	85	150		I_C = 50 mA V_{CE} = 10 V
h_{FE}	DC Pulse Current Gain (Note 5)	40	80	120		I_C = 150 mA V_{CE} = 10 V
h_{FE}	DC Pulse Current Gain (Note 5)	35	80			I_C = 10 mA V_{CE} = 10 V
h_{FE}	DC Current Gain	20	55			I_C = 0.1 mA V_{CE} = 10 V
h_{FE}(-55°C)	DC Pulse Current Gain (Note 5)	20	35			I_C = 10 mA V_{CE} = 10 V
V_{BE}(sat)	Base Saturation Voltage	0.6	0.7	0.8	Volts	I_C = 10 mA I_B = 1.0 mA
V_{CE}(sat)	Collector Saturation Voltage		0.25	0.4	Volts	I_C = 10 mA I_B = 1.0 mA
V_{BE}(sat)	Base Saturation Voltage		0.8	0.9	Volts	I_C = 50 mA I_B = 5.0 mA
V_{CE}(sat)	Collector Saturation Voltage		0.7	1.2	Volts	I_C = 50 mA I_B = 5.0 mA
h_{fe}	High Frequency Current Gain (f = 20 Mc)	2.5	4.0			I_C = 50 mA V_{CE} = 10 V
C_{obo}	Output Capacitance		12	15	pf	I_E = 0 V_{CB} = 10 V
C_{ibo}	Input Capacitance		57	85	pf	I_C = 0 V_{EB} = 0.5 V
I_{CBO}	Collector Cutoff Current		0.4	10	nA	I_E = 0 V_{CB} = 90 V
I_{CBO}(150°C)	Collector Cutoff Current		1.0	15	μA	I_E = 0 V_{CB} = 90 V
NF	Noise Figure (Note 6)		5.0	15	db	I_C = 0.3 mA V_{CE} = 10 V
V_{CEO}(sust)	Collector to Emitter Sustaining Voltage (Note 4)	100			Volts	I_C = 30 mA (pulsed) I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	120			Volts	I_C = 0.1 mA I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	7.0			Volts	I_C = 0 I_E = 0.1 mA
I_{EBO}	Emitter Cutoff Current		0.04	10	nA	I_C = 0 V_{EB} = 5.0 V

NOTES:

(1) These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
(2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
(3) These ratings give a maximum junction temperature of 200°C and junction to case thermal resistance of 43.8°C/watt (derating factor of 22.8 mW/°C).
(4) Rating refers to a high current point where collector to emitter voltage is lowest.
(5) Pulse Conditions: length = 300 μsec; duty cycle = 1%.
(6) Frequency = 1000 cps, Power Bandwidth = 200 cps, R_G = 510 Ω.

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SMALL SIGNAL CHARACTERISTICS (f = 1 KC)

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Conditions
h_{ib}	Input Resistance	20	27	30	Ohms	I_C = 1.0 mA V_{CB} = 5.0 V
		4.0	6.3	8.0	Ohms	I_C = 5.0 mA V_{CB} = 5.0 V
h_{ob}	Output Conductance		0.11	0.5	μmho	I_C = 1.0 mA V_{CB} = 5.0 V
			0.16	1.0	μmho	I_C = 5.0 mA V_{CB} = 5.0 V
h_{rb}	Voltage Feedback Ratio		0.36	1.25	$x10^{-4}$	I_C = 1.0 mA V_{CB} = 5.0 V
			0.55	1.75	$x10^{-4}$	I_C = 5.0 mA V_{CB} = 5.0 V
h_{fe}	Small Signal Current Gain	30	62	120		I_C = 1.0 mA V_{CE} = 5.0 V
		45	68	150		I_C = 5.0 mA V_{CE} = 5.0 V
h_{ie}	Input Resistance		510	1000	Ohms	I_C = 5.0 mA V_{CE} = 5.0 V
h_{oe}	Output Conductance		12	50	μmho	I_C = 5.0 mA V_{CE} = 5.0 V

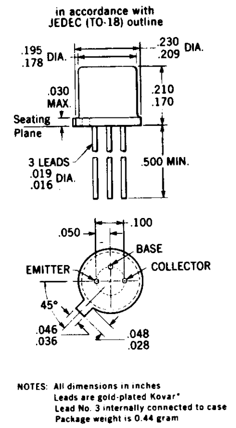
2N2616 • 2N2729

NPN ULTRA-HIGH FREQUENCY OSCILLATOR AND AMPLIFIER TYPE

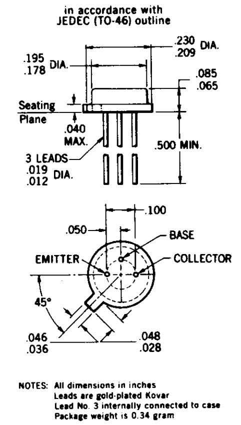
DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

GENERAL DESCRIPTION - The 2N2616 and 2N2729 are NPN Double-Diffused Silicon Planar Epitaxial Transistors. They are designed for low-noise, high-frequency amplifiers; 1 GHz local oscillators; non-neutralized IF amplifiers and non-saturating circuits with rise and fall times of less than 2.5 nanoseconds.

PHYSICAL DIMENSIONS



PHYSICAL DIMENSIONS



ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	-65°C to +300°C
Operating Junction Temperature	+200°C Maximum
Lead Temperature (Soldering, No Time Limit)	+300°C Maximum

Maximum Power Dissipation

Total Dissipation at 25°C Case Temperature (Notes 2 and 3)	0.8 Watt
at 25°C Ambient Temperature (Notes 2 and 3)	0.3 Watt

Maximum Voltages and Current

V_{CBO}	Collector to Base Voltage	30 Volts
V_{CEO}	Collector to Emitter Voltage (Note 4)	15 Volts
V_{EBO}	Emitter to Base Voltage	3.0 Volts
I_C	Collector Current	50 mA

ELECTRICAL CHARACTERISTICS (25°C Free Air Temperature unless otherwise noted)

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Conditions
h_{FE}	DC Current Gain	20	50			I_C = 3.0 mA V_{CE} = 1.0 V
V_{BE}(sat)	Pulsed Base-Emitter Saturation Voltage (Note 6)			1.0	Volts	I_C = 10 mA I_B = 1.0 mA
V_{CE}(sat)	Pulsed Collector-Emitter Saturation Voltage (Note 6)			0.4	Volts	I_C = 10 mA I_B = 1.0 mA
C_{obo}	Output Capacitance		2.4	2.8	pF	I_E = 0 V_{CB} = 10 V
C_{ibo}	Input Capacitance			2.0	pF	I_C = 0 V_{EB} = 0.5 V
I_{CBO}	Collector Cutoff Current			10	nA	I_E = 0 V_{CB} = 15 V
I_{CBO}(150°C)	Collector Cutoff Current			1.0	μA	I_E = 0 V_{CB} = 15 V
h_{fe}	High Frequency Current Gain (f = 100 MHz)	6.0	9.0			I_C = 4.0 mA V_{CE} = 10 V
A_p	Available Power Gain (neutralized) (f = 200 MHz)	15	18		dB	I_C = 6.0 mA V_{CE} = 12 V
P_o	Power Output (f = 500 MHz)	30	45		mW	I_C = 8.0 mA V_{CE} = 15 V
	Collector Efficiency (f = 500 MHz)	25			%	I_C = 8.0 mA V_{CE} = 15 V
NF	Noise Figure (Note 5)			6.0	dB	I_C = 1.0 mA V_{CE} = 6.0 V
V_{CEO}(sust)	Collector to Emitter Sustaining Voltage (Note 4)	15			Volts	I_C = 3.0 mA I_B = 0
BV_{CBO}	Collector to Base Breakdown Voltage	30			Volts	I_C = 1.0 μA I_E = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	3.0			Volts	I_C = 0 I_E = 10 μA

* Planar is a patented Fairchild process.

NOTES:

(1) These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.

(2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

(3) These ratings give a maximum junction temperature of 200°C and junction-to-case thermal resistance of 219°C/Watt (derating factor of 4.56 mW/°C).

(4) Rating refers to a high current point where collector-to-emitter voltage is lowest.

(5) f = 60 MHz, R_G = 400Ω.

(6) Pulse Conditions: length = 300μs; duty cycle ≤ 1%

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2N2695 • 2N2696 • 2N2927

PNP VHF AMPLIFIERS, HIGH CURRENT SWITCHES

DIFFUSED SILICON PLANAR EPITAXIAL TRANSISTORS

The 2N2695, 2N2696, and 2N2927 are PNP silicon PLANAR epitaxial transistors designed for digital and analog applications at current levels to 500 milliamperes. The high gain-bandwidth product, f_T, at high currents, makes them excellent units for line driving and memory applications.

ABSOLUTE MAXIMUM RATINGS [Note 1]

		2N2695	2N2696	2N2927
Maximum Temperatures				
Storage Temperature		−65°C to +200°C	−65°C to +200°C	−65°C to +200°C
Operating Junction Temperature		200°C Maximum	200°C Maximum	200°C Maximum
Lead Temperature (Soldering, 60 sec Time Limit)		300°C Maximum	300°C Maximum	300°C Maximum
Maximum Power Dissipation				
Total Dissipation at 25°C Case Temperature [Note 2 and 3]		2.0 Watts	1.2 Watts	3.0 Watts
at 100°C Case Temperature [Note 2 and 3]		1.0 Watt	0.68 Watt	1.7 Watts
at 25°C Ambient Temperature [Note 2 & 3]		0.36 Watt	0.36 Watt	0.8 Watt
Maximum Voltages				
V_{CBO}	Collector to Base Voltage	−25 Volts	−25 Volts	−25 Volts
V_{CEO}	Collector to Emitter Voltage [Note 4]	−25 Volts	−25 Volts	−25 Volts
V_{EBO}	Emitter to Base Voltage	−4.0 Volts	−4.0 Volts	−4.0 Volts
I_C	Collector Current [Note 2]	500 mA	500 mA	500 mA

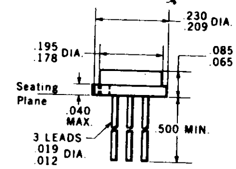
ELECTRICAL CHARACTERISTICS (25°C Free Air Temperature unless otherwise noted)

SYMBOL	CHARACTERISTICS	MIN.	MAX.	UNITS	TEST CONDITIONS	
h_{FE}	DC Pulse Current Gain [Note 5]	30	130		I_C = 50 mA	V_{CE} = −1.0 V
h_{FE}	DC Pulse Current Gain [Note 5]	20			I_C = 300 mA	V_{CE} = −2.0 V
h_{FE} (−55°C)	DC Pulse Current Gain [Note 5]	12			I_C = 50 mA	V_{CE} = −1.0 V
V_{BE} (sat)	Base Saturation Voltage		−1.1	Volts	I_C = 50 mA	I_B = 2.5 mA
V_{BE} (sat)	Base Saturation Voltage		−2.0	Volts	I_C = 300 mA	I_B = 30 mA
V_{CE} (sat)	Collector Saturation Voltage		−0.25	Volts	I_C = 50 mA	I_B = 2.5 mA
V_{CE} (sat)	Collector Saturation Voltage		−1.0	Volts	I_C = 300 mA	I_B = 30 mA
h_{fe}	High Frequency Current Gain (f = 100 mc)	1.0			I_C = 50 mA	V_{CE} = −3.0 V
C_{ob}	Output Capacitance		20	pf	I_E = 0	V_{CB} = −10 V
I_{CBO}	Collector Cutoff Current		25	nA	I_E = 0	V_{CB} = −10 V
I_{CBO} (150°C)	Collector Cutoff Current		5.0	μA	I_E = 0	V_{CB} = −10 V
BV_{CBO}	Collector to Base Breakdown Voltage	−25		Volts	I_C = 100 μA	I_E = 0
V_{CEO} (sust)	Collector to Emitter Sustaining Voltage [Note 4 & 5]	−25		Volts	I_C = 30 mA (pulsed)	I_B = 0
BV_{EBO}	Emitter to Base Breakdown Voltage	−4.0		Volts	I_C = 0	I_E = 100 μA
T_{on}	Turn On Time [Note 6]		75	nsec	$I_C \approx$ 300 mA	$I_{B1} \approx$ 30 mA
T_{off}	Turn Off Time [Note 6]		170	nsec	$I_C \approx$ 300 mA $I_{B1} \approx$ 30 mA	$I_{B2} \approx$ −30 mA

NOTES:

(1) These ratings are limiting values above which the serviceability of any individual semiconductor may be impaired.
(2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
(3) These ratings give a maximum junction temperature of 200°C and junction-to-case thermal resistance of 87.5°C/watt (derating factor of 11.4 mW/°C) for the 2N2695; for the 2N2696 146°C/watt (derating factor of 6.9 mW/°C); for the 2N2927 58.3°C/watt (derating factor of 17.2 mW/°C). Junction-to-ambient thermal resistance of 486°C/watt (derating factor of 2.1 mW/°C) for the 2N2695 and 2N2696; for the 2N2927 219°C/watt (derating factor of 4.56 mW/°C).
(4) Rating refers to a high current point where collector-to-emitter voltage is lowest.
(5) Pulse Conditions: length = 300 μsec; duty cycle = 1%.
(6) See switching circuit for exact values of I_C, I_{B1}, and I_{B2}.

PHYSICAL DIMENSIONS
in accordance with
JEDEC (TO-46) outline



2N2695

PHYSICAL DIMENSIONS
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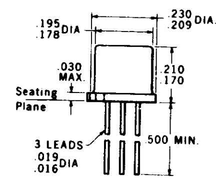
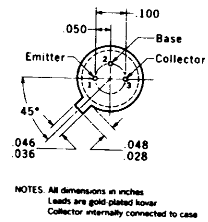
JEDEC (TO-18) outline



2N2696



2N2695 2N2696

PHYSICAL DIMENSIONS
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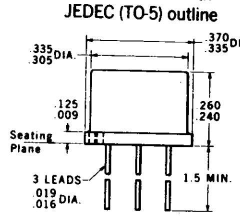
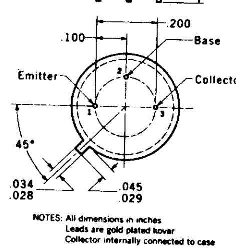
JEDEC (TO-5) outline





2N2927

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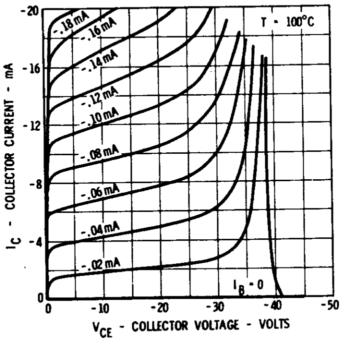
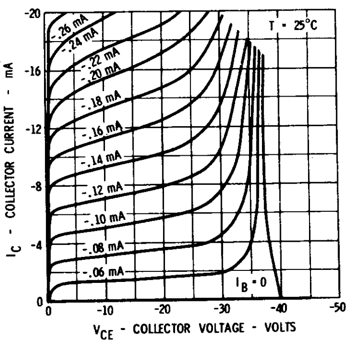
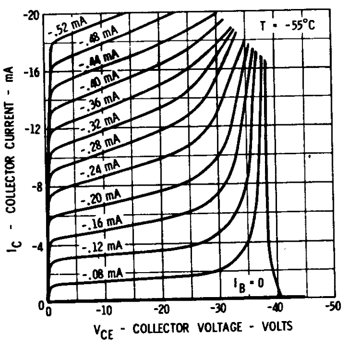
313 FAIRCHILD DRIVE, MOUNTAIN VIEW, CALIFORNIA, (415) 962-5011, TWX: 910-379-6435

TYPICAL COLLECTOR AND BASE CHARACTERISTICS*

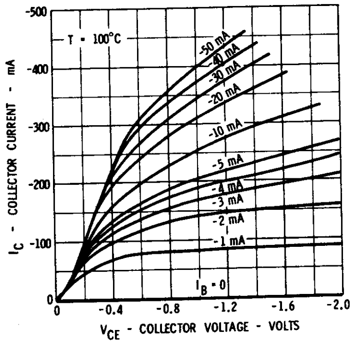
ACTIVE REGION

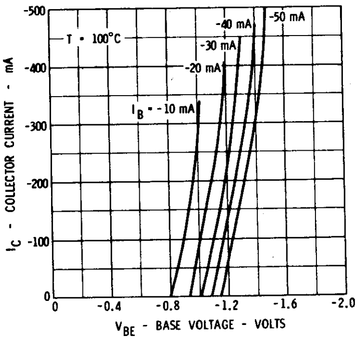


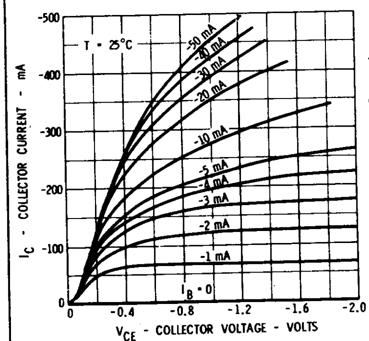


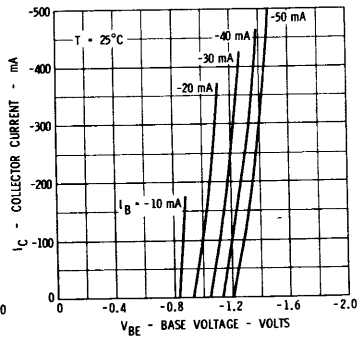


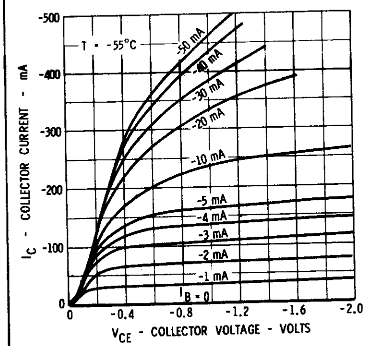
SATURATION REGION

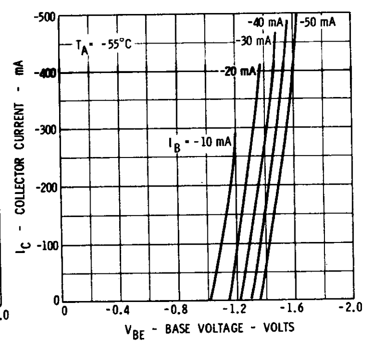




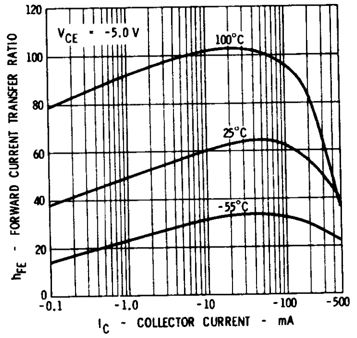




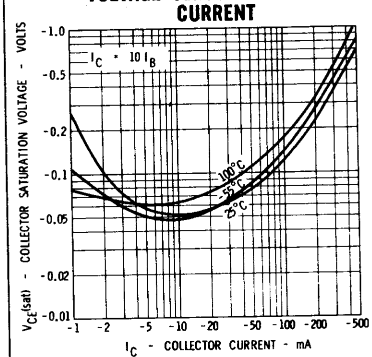




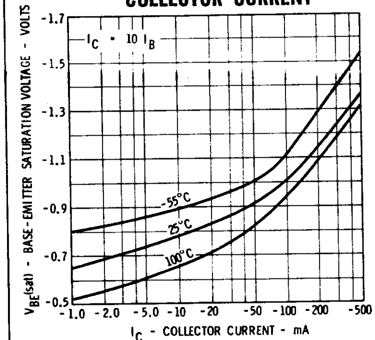
PULSED DC CURRENT GAIN VERSUS COLLECTOR CURRENT



COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT

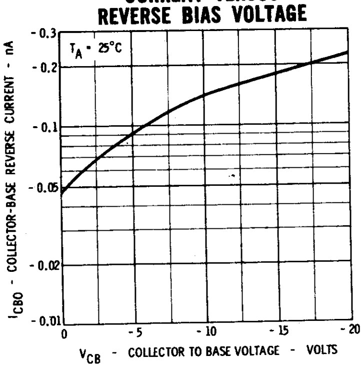


BASE-EMITTER SATURATION VOLTAGE VERSUS COLLECTOR CURRENT

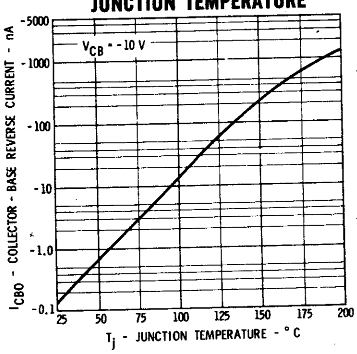


* Single family characteristics on Transistor Curve Tracer

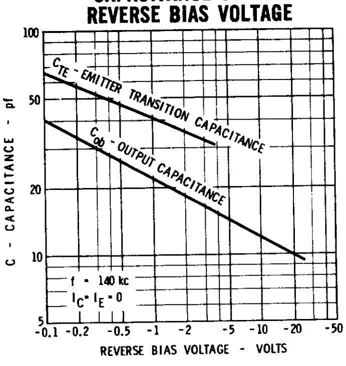
COLLECTOR-BASE DIODE REVERSE CURRENT VERSUS REVERSE BIAS VOLTAGE



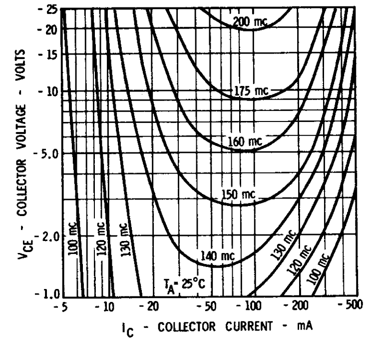
COLLECTOR-BASE DIODE REVERSE CURRENT VERSUS JUNCTION TEMPERATURE



INPUT AND OUTPUT CAPACITANCE VERSUS REVERSE BIAS VOLTAGE

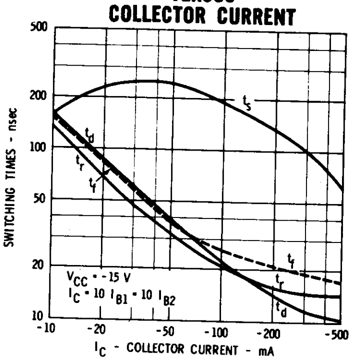


CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT (f_T)

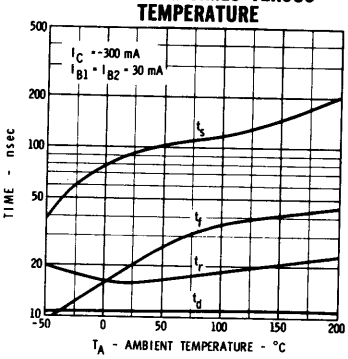


TYPICAL ELECTRICAL CHARACTERISTICS

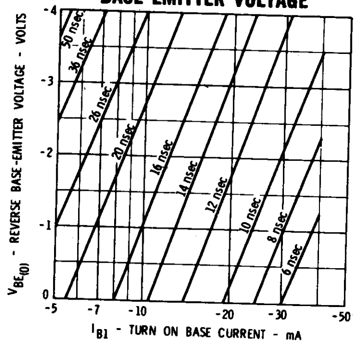
SWITCHING TIMES VERSUS COLLECTOR CURRENT



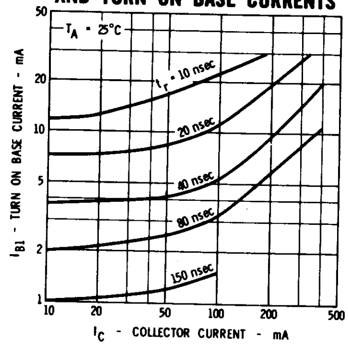
SWITCHING TIMES VERSUS TEMPERATURE



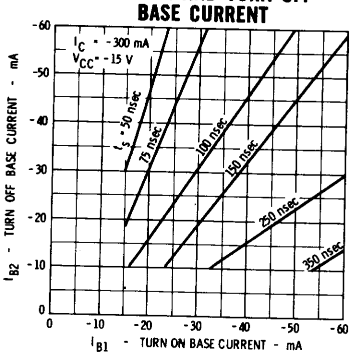
DELAY TIME VERSUS TURN ON BASE CURRENT AND REVERSE BASE EMITTER VOLTAGE



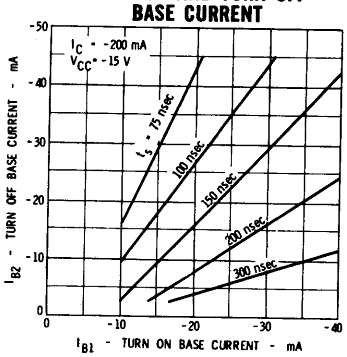
RISE TIME VERSUS COLLECTOR AND TURN ON BASE CURRENTS



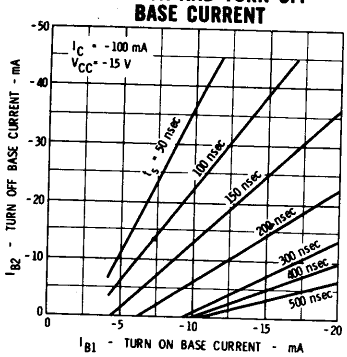
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENT



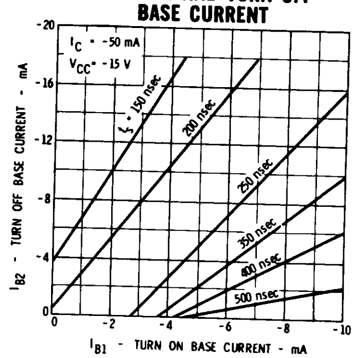
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENT



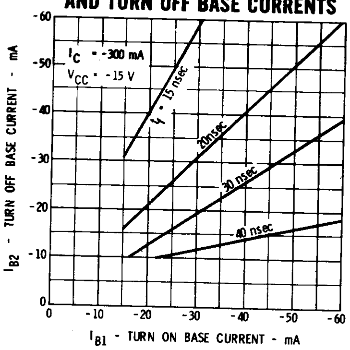
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENT



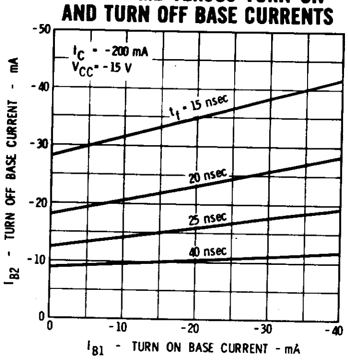
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENT



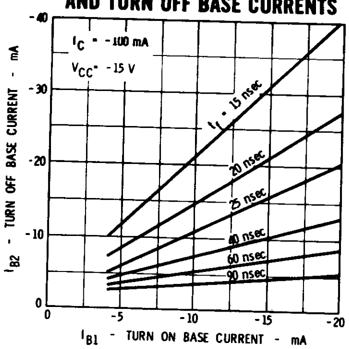
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



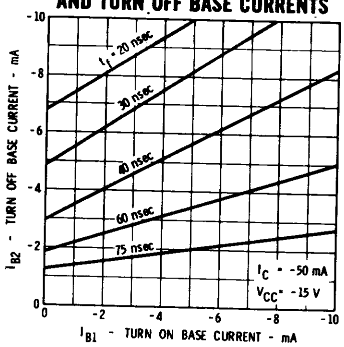
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



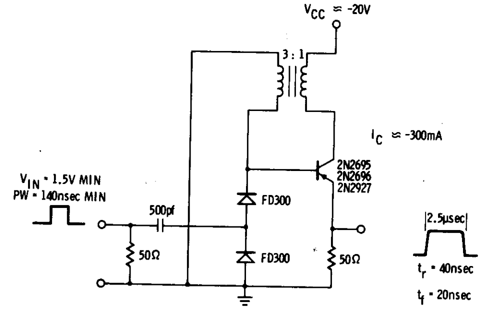
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



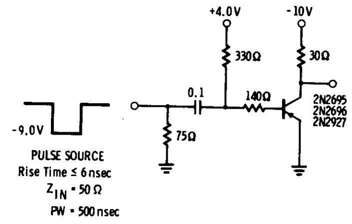
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



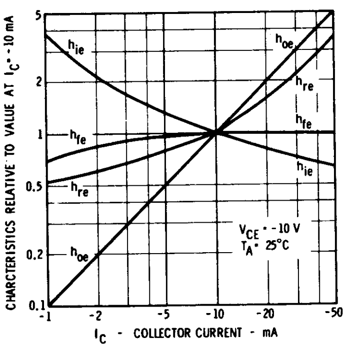
MONOSTABLE BLOCKING OSCILLATOR

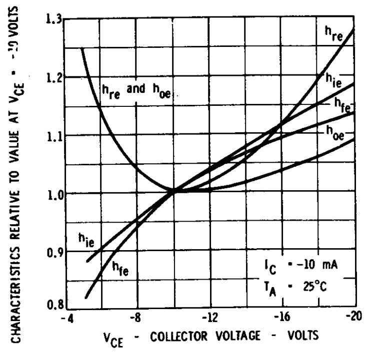


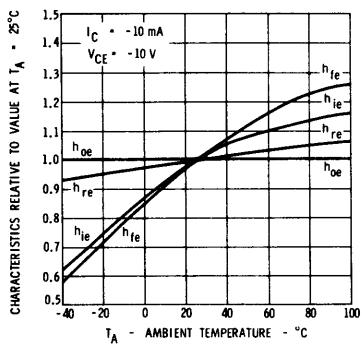
T_{on} and T_{off} TEST CIRCUIT



SMALL SIGNAL CHARACTERISTICS



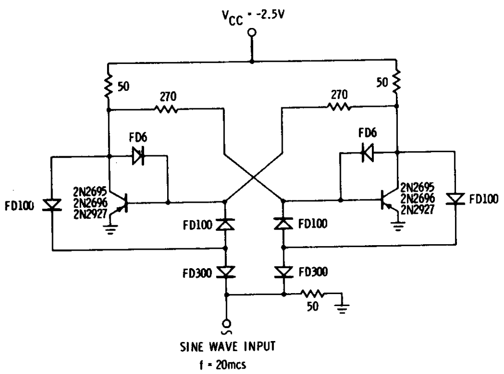




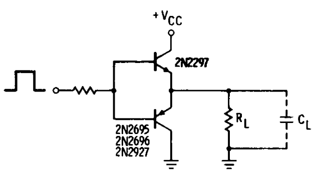
h PARAMETERS (f = 1kc)

SYMBOL	CHARACTERISTICS	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
h_{ie}	Input Resistance		480	1500	ohms	$I_C = 10$ mA $V_{CE} = -10$ V
h_{oe}	Output Conductance		80	1200	μmhos	$I_C = 10$ mA $V_{CE} = -10$ V
h_{re}	Voltage Feedback Ratio		162	2600	$x10^{-6}$	$I_C = 10$ mA $V_{CE} = -10$ V
h_{fe}	Small Signal Current Gain	25	74	180		$I_C = 10$ mA $V_{CE} = -10$ V

20mc BINARY COUNTER



LINE DRIVER



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