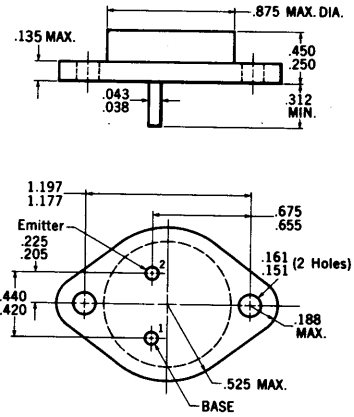
2N5264

NPN HIGH VOLTAGE-HIGH CURRENT TRANSISTOR

DIFFUSED SILICON PLANAR* EPITAXIAL DEVICE

- **HIGH VOLTAGE . . . . 300 V BV_{CES}, 180 V LV_{CEO}**
- **HIGH CURRENT . . . MAX. $V_{CE(sat)}$ OF 1.25 V AT $I_C = 7.0$ A, $I_B = 0.7$ A**
- **HIGH SPEED . . . . . MAX. t_f OF 1.0 μs AT $I_C = 7.0$ A, $I_B = \pm 0.7$ A**

PHYSICAL DIMENSIONS
in accordance with
JEDEC (TO-3) outline



NOTES: All dimensions in inches
Leads 1 and 2 electrically isolated from case
Case is third electrical connection (Collector)
Leads are nickel alloy
Package weight 8.71 grams

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Junction Temperature		+200°C
Maximum Power Dissipation (Note 2)		
Total Dissipation at 25°C Case Temperature (See Safe Operating Area)		**87 Watts**
Junction to Case Thermal Resistance		2.0°C/W
Maximum Voltages and Currents		
V_{CBO}	Collector to Base Voltage	300 Volts
V_{CEO}	Collector to Emitter Voltage	180 Volts
V_{EBO}	Emitter to Base Voltage	5.0 Volts
I_C	Collector Current	10.0 Amps
I_B	Base Current	2.0 Amps

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS	
BV_{CES}	**Collector to Emitter Breakdown Voltage**	**300**			**Volts**	$I_C = 1.0$ mA	$R_{BE} = 0\ \Omega$
$V_{CE(sat)}$	**Pulsed Collector Saturation Voltage** (Note 3)		**0.60**	**1.25**	**Volts**	$I_C = 7.0$ A	$I_B = 0.7$ A
$V_{BE(sat)}$	Pulsed Base Saturation Voltage (Note 3)		1.20	1.60	Volts	$I_C = 7.0$ A	$I_B = 0.7$ A
I_{CES}	Collector Cutoff Current		0.05	10	μA	$V_{CE} = 200$ V	$R_{BE} = 0\ \Omega$
BV_{EBO}	**Emitter to Base Breakdown Voltage**	**5.0**			Volts	$I_C = 0$	$I_E = 1.0$ mA
I_{EBO}	Emitter Cutoff Current		0.01	10	μA	$I_C = 0$	$V_{EB} = 4.0$ V
h_{FE}	DC Pulse Current Gain (Note 3)	30	125	300		$I_C = 1.0$ A	$V_{CE} = 2.5$ V
$V_{CEO(sus)}$	**Collector to Emitter Sustaining Voltage**	**180**			**Volts**	$I_C = 20$ mA	$R_{BE} = \infty$
$I_{CES}(150°C)$	Collector Cutoff Current		0.005	1.0	mA	$V_{CE} = 200$ V	$R_{BE} = 0\ \Omega$
$V_{CE(sat)}$	Pulsed Collector Saturation Voltage (Note 3)		0.35	0.65	Volts	$I_C = 5.0$ A	$I_B = 0.5$ A
$V_{BE(sat)}$	Pulsed Base Saturation Voltage (Note 3)		1.10	1.40	Volts	$I_C = 5.0$ A	$I_B = 0.5$ A
C_{cb}	Collector to Base Capacitance		55	80	pF	$I_E = 0$	$V_{CB} = 50$ V
h_{fe}	High Frequency Current Gain (f = 20 MHz)	2.5	3.5			$I_C = 100$ mA	$V_{CE} = 10$ V
t_{on}	Turn On Time		0.40	1.0	μs	$I_C = 7.0$ A, $I_{B1} = I_{B2} = 0.7$ A	
t_{stg}	Storage Time		0.50	1.5	μs	$I_C = 7.0$ A, $I_{B1} = I_{B2} = 0.7$ A	
t_f	**Fall Time**		**0.40**	**1.0**	**μs**	**$I_C = 7.0$ A, $I_{B1} = I_{B2} = \pm 0.7$ A**	
t_{on}	Turn On Time			1.5	μs	$I_C = 1.0$ A, $I_{B1} = I_{B2} = 0.1$ A	
t_{stg}	Storage Time			2.5	μs	$I_C = 1.0$ A, $I_{B1} = I_{B2} = 0.1$ A	
t_f	Fall Time			1.5	μs	$I_C = 1.0$ A, $I_{B1} = I_{B2} = 0.1$ A	

NOTES:
(1) These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
(2) The maximum power dissipation rating is the greatest allowable DC power. Maximum allowable power dissipation at any operating voltage is determined from the "Forward Biased Safe Operating Area" curve.
(3) Pulse Conditions: length = 300 μs; duty cycle = 1%.

*Planar is a patented Fairchild process.

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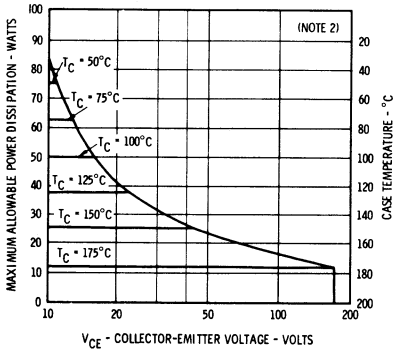
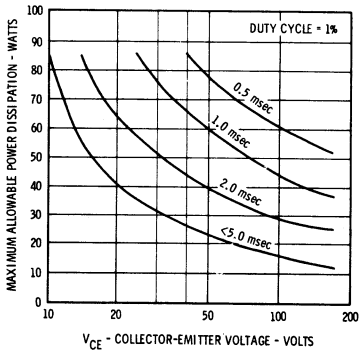
DC FORWARD BIASED SAFE OPERATING AREA

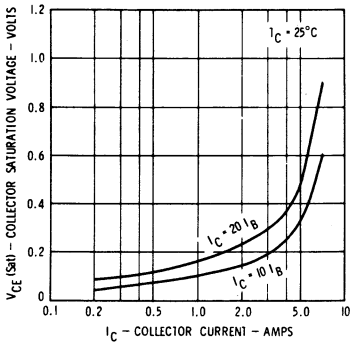


PULSED FORWARD BIASED SAFE OPERATING AREA

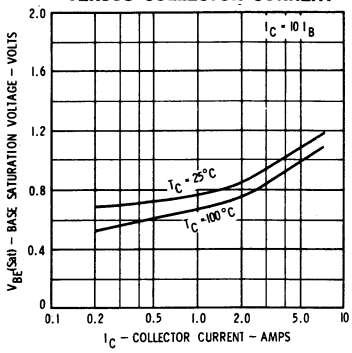


TYPICAL ELECTRICAL CHARACTERISTICS

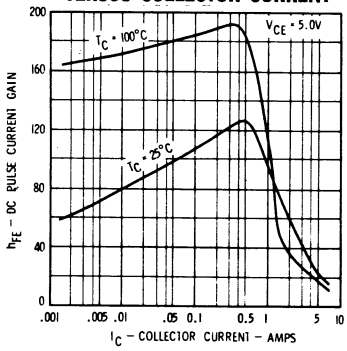
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



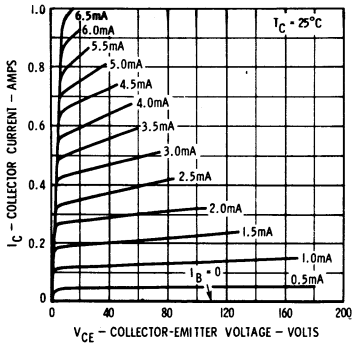
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



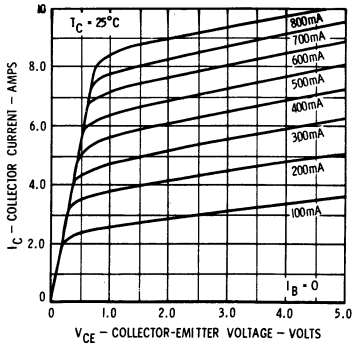
DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



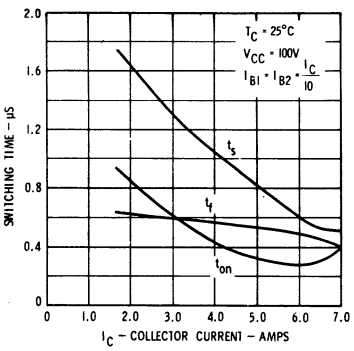
COLLECTOR CHARACTERISTICS ACTIVE REGION*



COLLECTOR CHARACTERISTICS SATURATION REGION*



SWITCHING TIME VERSUS COLLECTOR CURRENT



*Single family characteristics on Transistor Curve Tracer.

2N5284 • 2N5285

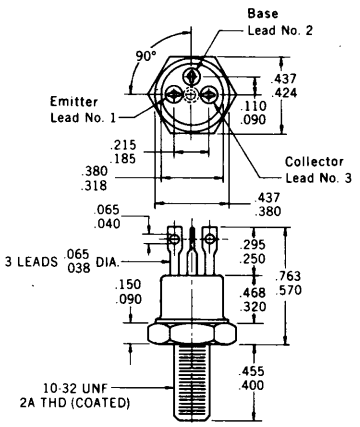
50 WATT NPN POWER TRANSISTORS

DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

SEE 2N5286 • 2N5287 FOR PNP COMPLEMENT

- **HIGH POWER . . . . . 50 WATTS AT $T_C = 50°C$, $V_{CE} = 40$ V**
- **HIGH VOLTAGE . . . . . 100 V (MIN) LV_{CEO}**
- **HIGH CURRENT SATURATION VOLTAGE . . . 1.5 V (MAX) $V_{CE(sat)}$ AT 5.0 A**
- **HIGH FREQUENCY . . . . . 60 AND 70 MHz (MIN) f_T**
- **BETA GUARANTEED AT 3 POINTS . . . . . 50 mA, 2.5 A AND 5.0 A**
- **ISOLATED COLLECTOR PACKAGE . . . . . NO ISOLATING HARDWARE REQUIRED**
- **DISCRETE EMITTER GEOMETRY WITH INTEGRATED FEEDBACK RESISTORS**

PHYSICAL DIMENSIONS
(in accordance with JEDEC TO-59 outline)



NOTES: All dimensions in inches
All leads electrically isolated from case
Package weight is 6.44 grams

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	−65°C to +200°C
Lead Temperature (Soldering, 60 seconds time limit)	+300°C

Maximum Power Dissipation

Total Dissipation at 50°C Case Temperature, $V_{CE} = 40$ V (See Maximum Permissible Power Curve and Note 4)	50 Watts

Maximum Voltages and Current

V_{CES}	Collector to Emitter Voltage	120 Volts
V_{CEO}	Collector to Emitter Voltage (Note 2)	100 Volts
V_{EBO}	Emitter to Base Voltage	6.0 Volts
I_C	Collector Current	5.0 Amps

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5284 MIN.	2N5284 TYP.	2N5284 MAX.	2N5285 MIN.	2N5285 TYP.	2N5285 MAX.	UNITS	TEST CONDITIONS	
$V_{CEO(sus)}$	**Collector to Emitter Sustaining Voltage** (Notes 2 and 3)	**100**			**100**			**Volts**	**$I_C = 100$ mA**	**$I_B = 0$**
BV_{CES}	Collector to Emitter Breakdown Voltage	120			120			Volts	$I_C = 1.0$ mA	$V_{BE} = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0			6.0			Volts	$I_C = 0$	$I_E = 1.0$ mA
h_{FE}	**DC Pulse Current Gain** (Note 3)	**20**	**46**		**50**	**100**			**$I_C = 50$ mA**	**$V_{CE} = 5.0$ V**
h_{FE}	DC Pulse Current Gain (Note 3)	30	64	90	70	114	200		$I_C = 2.5$ A	$V_{CE} = 5.0$ V
$h_{FE}(-55°C)$	DC Pulse Current Gain (Note 3)	15	26		35	50			$I_C = 2.5$ A	$V_{CE} = 5.0$ V
h_{FE}	**DC Pulse Current Gain** (Note 3)	**20**	**53**		**40**	**65**			**$I_C = 5.0$ A**	**$V_{CE} = 5.0$ V**
h_{fe}	**High Frequency Current Gain** (f = 20 MHz)	**3.0**	**3.4**		**3.5**	**4.4**			**$I_C = 0.5$ A**	**$V_{CE} = 5.0$ V**
$V_{CE(sat)}$	Pulsed Collector Saturation Voltage (Note 3)		0.43	0.75		0.43	0.75	Volts	$I_C = 2.5$ A	$I_B = 0.25$ A
$V_{CE(sat)}$	**Pulsed Collector Saturation Voltage** (Note 3)		**0.85**	**1.5**		**0.85**	**1.5**	**Volts**	**$I_C = 5.0$ A**	**$I_B = 0.5$ A**

Additional Electrical Characteristics on page 2
Notes on page 2

*Planar is a patented Fairchild process.

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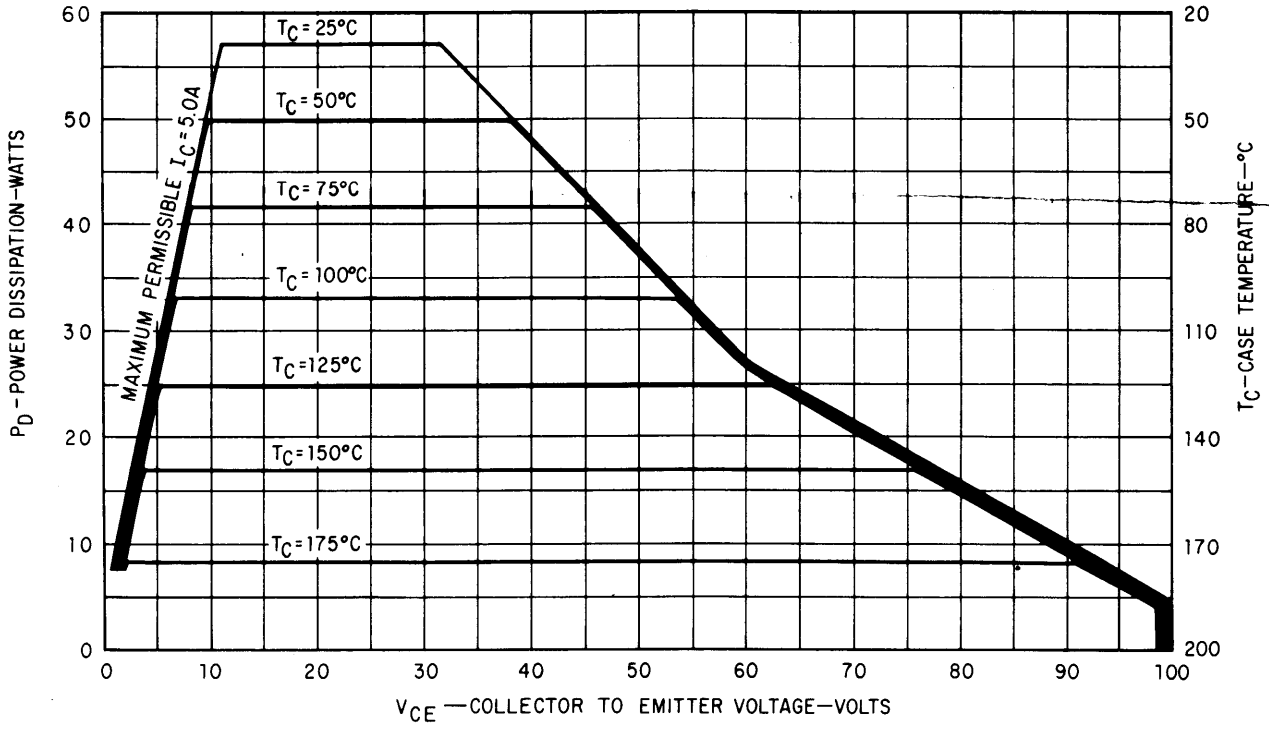
ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

		2N5284			2N5285					
SYMBOL	CHARACTERISTIC	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS	
$V_{BE(sat)}$	Pulsed Base Saturation Voltage (Note 3)		1.16	1.45		1.16	1.45	Volts	$I_C = 2.5$ A	$I_B = 0.25$ A
$V_{BE(sat)}$	Pulsed Base Saturation Voltage (Note 3)		1.50	2.2		1.50	2.2	Volts	$I_C = 5.0$ A	$I_B = 0.5$ A
$V_{BE(on)}$	Pulsed Base Emitter "ON" Voltage (Note 3)			1.45			1.45	Volts	$I_C = 2.5$ A	$V_{CE} = 5.0$ V
I_{CES}	Collector Cutoff Current		0.007	1.0		0.007	1.0	μA	$V_{CE} = 80$ V	$V_{BE} = 0$
I_{CEO}	Collector Cutoff Current			50			50	μA	$I_B = 0$	$V_{CE} = 60$ V
I_{EBO}	Emitter Cutoff Current			1.0			1.0	μA	$I_C = 0$	$V_{EB} = 5.0$ V
$I_{CEX}(150°C)$	Collector Reverse Current			500			500	μA	$V_{CE} = 80$ V	$V_{EB} = 2.0$ V
C_{cb}	Collector to Base Capacitance		90	250		90	250	pF	$I_E = 0$	$V_{CB} = 10$ V
h_{fe}	Small Signal Current Gain (f = 1.0 kHz)	20			20				$I_C = 100$ mA	$V_{CE} = 5.0$ V

NOTES:

(1) These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
(2) This rating refers to a high current point where collector to emitter voltage is lowest.
(3) Pulse Conditions: length = 300 μs; duty cycle = 1%.
(4) Contact factory for maximum permissible power under pulsed or reverse biased operating conditions.

MAXIMUM PERMISSIBLE DC FORWARD BIASED POWER DISSIPATION



2N5286 • 2N5287

50 WATT PNP POWER TRANSISTORS

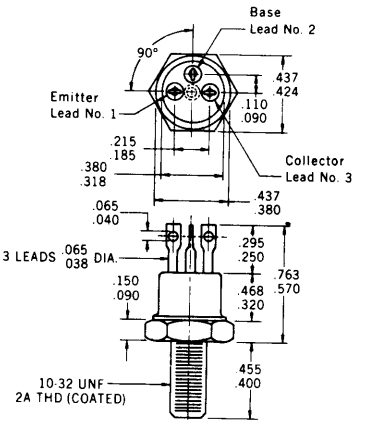
DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

SEE 2N5284 • 2N5285 FOR NPN COMPLEMENT

FEATURES

- **HIGH POWER . . . . . 50 WATTS AT $T_C = 50°C$, $V_{CE} = -40$ V**
- **HIGH VOLTAGE . . . . . −100 V (MIN) LV_{CEO}**
- **HIGH CURRENT SATURATION VOLTAGE . . . −1.5 V (MAX) $V_{CE(sat)}$ AT 5.0 A**
- **HIGH FREQUENCY . . . . . 60 AND 70 MHz (MIN) f_T**
- **BETA GUARANTEED AT 3 POINTS . . . . . 50 mA, 2.5 A AND 5.0 A**
- **ISOLATED COLLECTOR PACKAGE . . . . . NO ISOLATING HARDWARE REQUIRED**
- **DISCRETE EMITTER GEOMETRY WITH INTEGRATED FEEDBACK RESISTORS**

PHYSICAL DIMENSIONS
(in accordance with JEDEC TO-59 outline)



NOTES: All dimensions in inches
All leads electrically isolated from case
Package weight is 6.44 grams

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Junction Temperature		−65°C to +200°C
Lead Temperature (Soldering, 60 seconds time limit)		+300°C
Maximum Power Dissipation		
Total Dissipation at 50°C Case Temperature, $V_{CE} = -40$ V (See Maximum Permissible Power Curve and Note 4)		50 Watts
Maximum Voltages and Current		
V_{CES}	Collector to Emitter Voltage	−100 Volts
V_{CEO}	Collector to Emitter Voltage (Note 2)	−100 Volts
V_{EBO}	Emitter to Base Voltage	−5.5 Volts
I_C	Collector Current	5.0 Amps

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5286 MIN.	2N5286 TYP.	2N5286 MAX.	2N5287 MIN.	2N5287 TYP.	2N5287 MAX.	UNITS	TEST CONDITIONS	
$V_{CEO(sus)}$	**Collector to Emitter Sustaining Voltage** (Notes 2 and 3)	**−100**			**−100**			**Volts**	**$I_C = 100$ mA**	**$I_B = 0$**
BV_{CES}	Collector to Emitter Breakdown Voltage	−100			−100			Volts	$I_C = 1.0$ mA	$V_{BE} = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.5			−5.5			Volts	$I_C = 0$	$I_E = 1.0$ mA
h_{FE}	**DC Pulse Current Gain** (Note 3)	**20**	**52**		**50**	**130**			**$I_C = 50$ mA**	**$V_{CE} = -5.0$ V**
h_{FE}	**DC Pulse Current Gain** (Note 3)	**30**	**50**	**90**	**70**	**114**	**200**		**$I_C = 2.5$ A**	**$V_{CE} = -5.0$ V**
$h_{FE}(-55°C)$	DC Pulse Current Gain (Note 3)	15	32		35	90			$I_C = 2.5$ A	$V_{CE} = -5.0$ V
h_{FE}	**DC Pulse Current Gain** (Note 3)	**20**	**38**		**40**	**77**			**$I_C = 5.0$ A**	**$V_{CE} = -5.0$ V**
h_{fe}	**High Frequency Current Gain** (f = 20 MHz)	**3.0**	**4.05**		**3.5**	**4.85**			**$I_C = 0.5$ A**	**$V_{CE} = -5.0$ V**
$V_{CE(sat)}$	Pulsed Collector Saturation Voltage (Note 3)		−0.45	−0.75		−0.45	−0.75	Volts	$I_C = 2.5$ A	$I_B = 0.25$ A
$V_{CE(sat)}$	**Pulsed Collector Saturation Voltage** (Note 3)		**−0.9**	**−1.5**		**−0.9**	**−1.5**	**Volts**	**$I_C = 5.0$ A**	**$I_B = 0.5$ A**

Additional Electrical Characteristics on Page 2
Notes on Page 2

*Planar is a patented Fairchild process.

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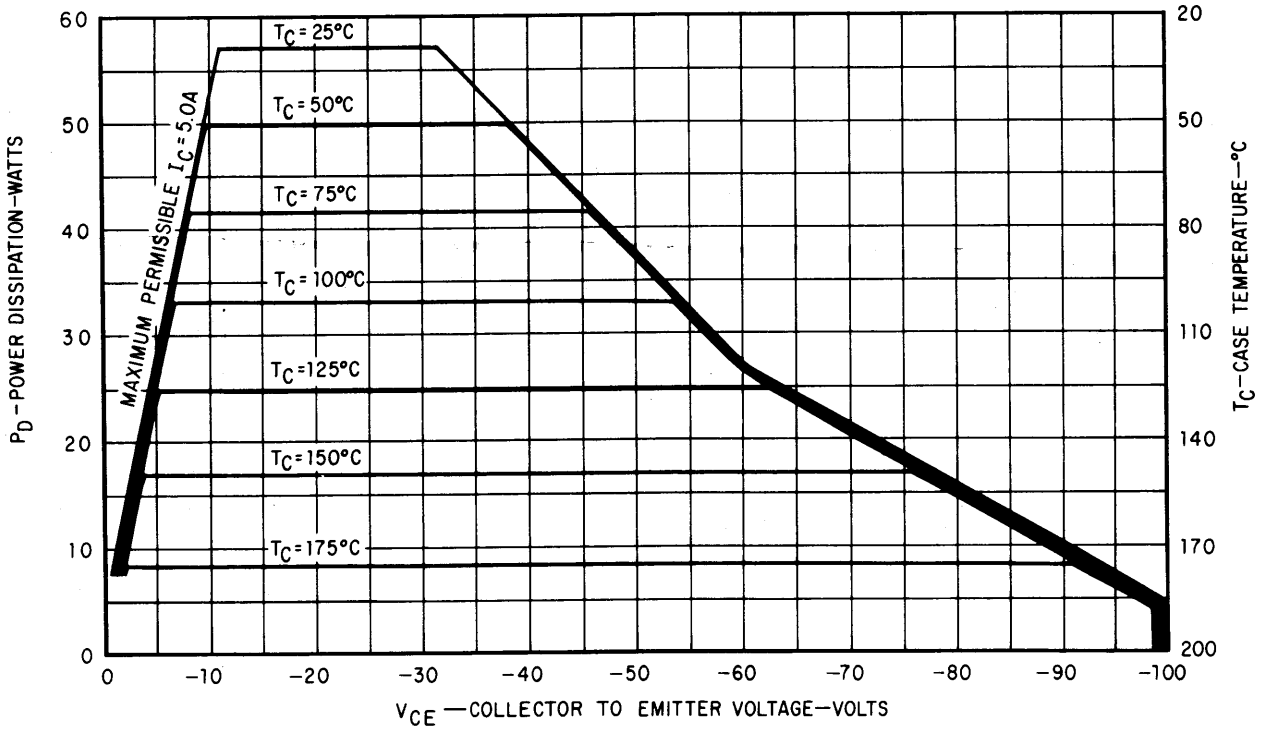
ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5286 MIN.	2N5286 TYP.	2N5286 MAX.	2N5287 MIN.	2N5287 TYP.	2N5287 MAX.	UNITS	TEST CONDITIONS	
$V_{BE(sat)}$	Pulsed Base Saturation Voltage (Note 3)		−1.1	−1.45		−1.1	−1.45	Volts	$I_C = 2.5$ A	$I_B = 0.25$ A
$V_{BE(sat)}$	Pulsed Base Saturation Voltage (Note 3)		−1.55	−2.2		−1.55	−2.2	Volts	$I_C = 5.0$ A	$I_B = 0.5$ A
$V_{BE(on)}$	Pulsed Base Emitter "ON" Voltage (Note 3)			−1.45			−1.45	Volts	$I_C = 2.5$ A	$V_{CE} = -5.0$ V
I_{CES}	Collector Cutoff Current		0.006	1.0		0.006	1.0	μA	$V_{CE} = -80$ V	$V_{BE} = 0$
I_{CEO}	Collector Cutoff Current			50			50	μA	$I_B = 0$	$V_{CE} = -60$ V
I_{EBO}	Emitter Cutoff Current			1.0			1.0	μA	$I_C = 0$	$V_{BE} = 4.0$ V
I_{CEX}(150°C)	Collector Reverse Current			500			500	μA	$V_{CE} = -80$ V	$V_{BE} = 2.0$ V
C_{cb}	Collector to Base Capacitance		170	250		170	250	pF	$I_E = 0$	$V_{CB} = -10$ V
h_{fe}	Small Signal Current Gain (f = 1.0 kHz)	20			20				$I_C = 100$ mA	$V_{CE} = -5.0$ V

NOTES:

(1) These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
(2) This rating refers to a high current point where collector to emitter voltage is lowest.
(3) Pulse Conditions: length = 300 μs; duty cycle = 1%.
(4) Contact factory for maximum permissible power under pulsed or reverse biased operating conditions.

MAXIMUM PERMISSIBLE DC FORWARD BIASED POWER DISSIPATION



2N5288 • 2N5289

100 WATT NPN POWER TRANSISTORS

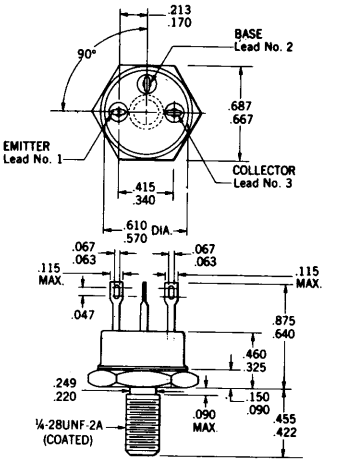
DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

SEE 2N5290 • 2N5291 FOR PNP COMPLEMENT

- **HIGH POWER** . . . . . **100 WATTS AT $T_C = 50°C$, $V_{CE} = 40$ V**
- **HIGH VOLTAGE** . . . . . **100 V (MIN) LV_{CEO}**
- **HIGH CURRENT SATURATION VOLTAGE** . . . **1.5 V (MAX) $V_{CE(sat)}$ AT 10 A**
- **HIGH FREQUENCY** . . . . . **30 AND 40 MHz (MIN) f_T**
- **BETA GUARANTEED AT 3 POINTS** . . . . . **100 mA, 5.0 A AND 10 A**
- **ISOLATED COLLECTOR PACKAGE** . . . . . **NO ISOLATING HARDWARE REQUIRED**
- **DISCRETE EMITTER GEOMETRY WITH INTEGRATED FEEDBACK RESISTORS**

PHYSICAL DIMENSIONS

Similar to JEDEC (TO-61)



NOTES: All dimensions in inches
All leads electrically isolated from case
Package weight is 14.1 grams

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures		
Storage Temperature		−65°C to +200°C
Operating Junction Temperature		−65°C to +200°C
Lead Temperature (Soldering, 60 seconds time limit)		+300°C
Maximum Power Dissipation		
Total Dissipation at 50°C Case Temperature, $V_{CE} = 40$ V (See Maximum Permissible Power Curve and Note 4)		**100 Watts**
Maximum Voltages and Current		
V_{CES}	Collector to Emitter Voltage	120 Volts
V_{CEO}	Collector to Emitter Voltage (Note 2)	100 Volts
V_{EBO}	Emitter to Base Voltage	6.0 Volts
I_C	Collector Current	10 Amps

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5288 MIN.	2N5288 MAX.	2N5289 MIN.	2N5289 MAX.	UNITS	TEST CONDITIONS	
$V_{CEO(sus)}$	**Collector to Emitter Sustaining Voltage** (Notes 2 and 3)	**100**		**100**		**Volts**	$I_C = 200$ mA	$I_B = 0$
BV_{CES}	Collector to Emitter Breakdown Voltage	120		120		Volts	$I_C = 1.0$ mA	$V_{BE} = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		6.0		Volts	$I_C = 0$	$I_E = 1.0$ mA
h_{FE}	**DC Pulse Current Gain** (Note 3)	**20**		**50**			**$I_C = 100$ mA**	**$V_{CE} = 5.0$ V**
h_{FE}	**DC Pulse Current Gain** (Note 3)	**30**	**90**	**70**	**200**		**$I_C = 5.0$ A**	**$V_{CE} = 5.0$ V**
$h_{FE}(-55°C)$	DC Pulse Current Gain (Note 3)	12		35			$I_C = 5.0$ A	$V_{CE} = 5.0$ V
h_{FE}	**DC Pulse Current Gain** (Note 3)	**20**		**45**			**$I_C = 10$ A**	**$V_{CE} = 5.0$ V**
h_{fe}	**High Frequency Current Gain ($f = 20$ MHz)**	**1.5**		**2.0**			**$I_C = 2.0$ A**	**$V_{CE} = 5.0$ V**
$V_{CE(sat)}$	Pulsed Collector Saturation Voltage (Note 3)		0.9		0.9	Volts	$I_C = 5.0$ A	$I_B = 0.5$ A
$V_{CE(sat)}$	**Pulsed Collector Saturation Voltage** (Note 3)		**1.5**		**1.5**	**Volts**	**$I_C = 10$ A**	**$I_B = 1.0$ A**

Additional Electrical Characteristics on page 2

*Planar is a patented Fairchild process.

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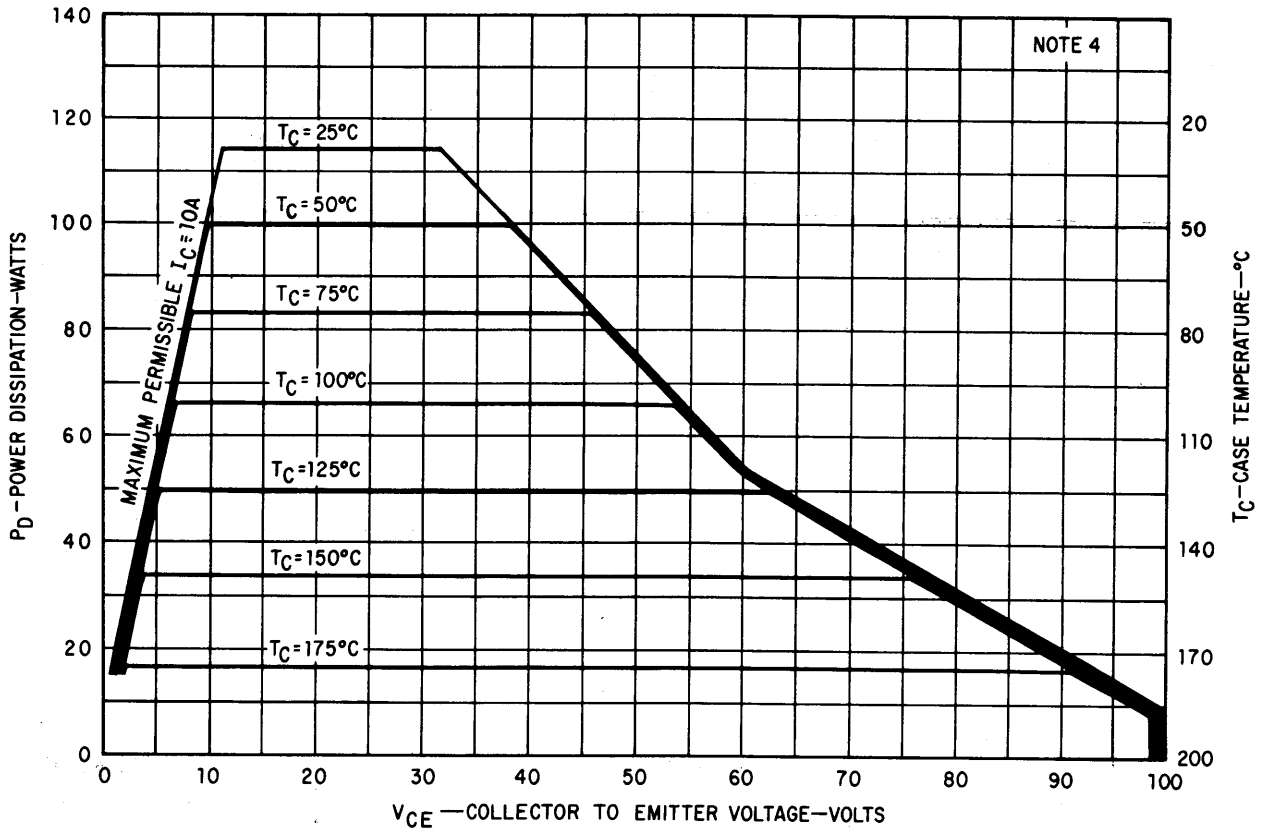
ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5288 MIN.	2N5288 MAX.	2N5289 MIN.	2N5289 MAX.	UNITS	TEST CONDITIONS	
$V_{BE(sat)}$	Pulsed Base Saturation Voltage (Note 3)		1.8		1.8	Volts	$I_C = 5.0$ A	$I_B = 0.5$ A
$V_{BE(sat)}$	Pulsed Base Saturation Voltage (Note 3)		2.2		2.2	Volts	$I_C = 10$ A	$I_B = 1.0$ A
$V_{BE(on)}$	Pulsed Base Emitter "ON" Voltage (Note 3)		1.8		1.8	Volts	$I_C = 5.0$ A	$V_{CE} = 5.0$ V
I_{CES}	Collector Cutoff Current		1.0		1.0	μA	$V_{CE} = 80$ V	$V_{BE} = 0$
I_{EBO}	Emitter Cutoff Current		1.0		1.0	μA	$I_C = 0$	$V_{EB} = 5.0$ V
I_{CEX}(150°C)	Collector Reverse Current		500		500	μA	$V_{CE} = 80$ V	$V_{EB} = 2.0$ V
C_{cb}	Collector to Base Capacitance		275		275	pF	$I_E = 0$	$V_{CB} = 10$ V
I_{CES}	Collector Cutoff Current		1.0		1.0	mA	$V_{CE} = 120$ V	$V_{BE} = 0$
I_{EBO}	Emitter Cutoff Current		1.0		1.0	mA	$I_C = 0$	$V_{EB} = 6.0$ V
I_{CEO}	Collector Cutoff Current		50		50	μA	$I_B = 0$	$V_{CE} = 60$ V
h_{fe}	Small Signal Current Gain (f = 1.0 kHz)	20		50			$I_C = 200$ mA	$V_{CE} = 5.0$ V

NOTES:
(1) These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
(2) This rating refers to a high current point where collector to emitter voltage is lowest.
(3) Pulse Conditions: length = 300 μs; duty cycle = 1%.
(4) Contact factory for maximum permissible power under pulsed or reverse biased operating conditions.

MAXIMUM PERMISSIBLE DC FORWARD BIASED POWER DISSIPATION



2N5290 • 2N5291

100 WATT PNP POWER TRANSISTORS

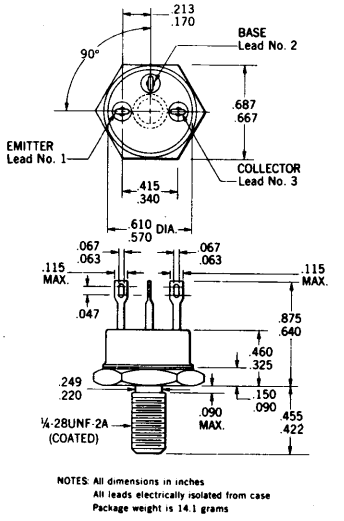
DIFFUSED SILICON PLANAR* EPITAXIAL TRANSISTORS

SEE 2N5288 • 2N5289 FOR NPN COMPLEMENT

- **HIGH POWER** . . . . . **100 WATTS AT $T_C = 50°C$, $V_{CE} = -40$ V**
- **HIGH VOLTAGE** . . . . . **−100 V (MIN) LV_{CEO}**
- **HIGH CURRENT SATURATION VOLTAGE** . . . **1.5 V (MAX) $V_{CE(sat)}$ AT 10 A**
- **HIGH FREQUENCY** . . . . . **30 AND 40 MHz (MIN) f_T**
- **BETA GUARANTEED AT 3 POINTS** . . . . . **100 mA, 5.0 A AND 10 A**
- **ISOLATED COLLECTOR PACKAGE** . . . . . **NO ISOLATING HARDWARE REQUIRED**
- **DISCRETE EMITTER GEOMETRY WITH INTEGRATED FEEDBACK RESISTORS**

PHYSICAL DIMENSIONS

Similar to JEDEC (TO-61)



NOTES: All dimensions in inches
All leads electrically isolated from case
Package weight is 14.1 grams

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	−65°C to +200°C
Lead Temperature (Soldering, 60 seconds time limit)	+300°C

Maximum Power Dissipation

Total Dissipation at 50°C Case Temperature, $V_{CE} = -40$ V (See Maximum Permissible Power Curve and Note 4)	**100 Watts**

Maximum Voltages and Current

V_{CES}	Collector to Emitter Voltage	−100 Volts
V_{CEO}	Collector to Emitter Voltage (Note 2)	−100 Volts
V_{EBO}	Emitter to Base Voltage	−5.5 Volts
I_C	Collector Current	10 Amps

ELECTRICAL CHARACTERISTICS (25°C Case Temperature unless otherwise noted)

SYMBOL	CHARACTERISTIC	2N5290 MIN.	2N5290 MAX.	2N5291 MIN.	2N5291 MAX.	UNITS	TEST CONDITIONS	
$V_{CEO(sus)}$	**Collector to Emitter Sustaining Voltage** (Notes 2 and 3)	**−100**		**−100**		**Volts**	**$I_C = 200$ mA**	**$I_B = 0$**
BV_{CES}	Collector to Emitter Breakdown Voltage	−100		−100		Volts	$I_C = 1.0$ mA	$V_{BE} = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	−5.5		−5.5		Volts	$I_C = 0$	$I_E = 1.0$ mA
h_{FE}	**DC Pulse Current Gain** (Note 3)	**20**		**50**			**$I_C = 100$ mA**	**$V_{CE} = -5.0$ V**
h_{FE}	**DC Pulse Current Gain** (Note 3)	**30**	**90**	**70**	**200**		**$I_C = 5.0$ A**	**$V_{CE} = -5.0$ V**
$h_{FE}(-55°C)$	DC Pulse Current Gain (Note 3)	12		35			$I_C = 5.0$ A	$V_{CE} = -5.0$ V
h_{FE}	**DC Pulse Current Gain** (Note 3)	**20**		**45**			**$I_C = 10$ A**	**$V_{CE} = -5.0$ V**
h_{fe}	**High Frequency Current Gain (f = 20 MHz)**	**1.5**		**2.0**			**$I_C = 2.0$ A**	**$V_{CE} = -5.0$ V**
$V_{CE(sat)}$	Pulsed Collector Saturation Voltage (Note 3)		−0.9		−0.9	Volts	$I_C = 5.0$ A	$I_B = 0.5$ A
$V_{CE(sat)}$	**Pulsed Collector Saturation Voltage** (Note 3)		**−1.5**		**−1.5**	**Volts**	**$I_C = 10$ A**	**$I_B = 1.0$ A**

Additional Electrical Characteristics on page 2

*Planar is a patented Fairchild process.

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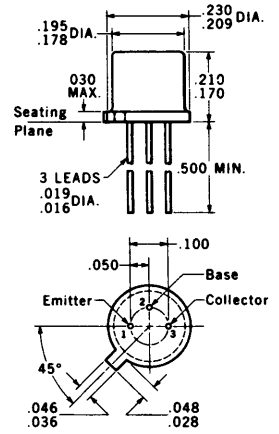
2N5292

RADIATION RESISTANT, PNP HIGH SPEED SATURATED SWITCH

DIFFUSED SILICON PLANAR* II EPITAXIAL TRANSISTOR

- **GUARANTEED PERFORMANCE AFTER NEUTRON IRRADIATION OF 3×10^{14} nvt $>$ 10 keV**
- **FAST SWITCHING . . . . . $t_{on} = 25$ ns (MAX) AFTER RADIATION**
  $t_{off} = 35$ ns (MAX) AFTER RADIATION
- **HIGH FREQUENCY . . . . . $f_T = 600$ MHz (MIN) AFTER RADIATION**
- **LOW CAPACITANCE . . . . . $C_{cb} = 4.5$ pF (MAX) AFTER RADIATION**
- **LOW SATURATION VOLTAGE . . . $V_{CE(sat)} = -0.65$ V (MAX) AT $I_C = 100$ mA AFTER RADIATION**

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



NOTES: All dimensions in inches
Leads are gold-plated kovar
Collector internally connected to case
Package weight is 0.44 gram

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures

Storage Temperature	−65°C to +200°C
Operating Junction Temperature	200°C
Lead Temperature (Soldering, 60 second time limit)	300°C

Maximum Power Dissipation (Notes 2 and 3)

Total Dissipation at 25°C Case Temperature	1.0 Watts
at 100°C Case Temperature	0.72 Watt
at 25°C Ambient Temperature	0.36 Watt

Maximum Voltages

V_{CBO}	Collector to Base Voltage	−12 Volts
V_{CEO}	Collector to Emitter Voltage (Note 4)	−12 Volts
V_{EBO}	Emitter to Base Voltage	−4.5 Volts

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

SYMBOL	CHARACTERISTICS	PRE-IRRADIATION MIN.	PRE-IRRADIATION TYP.	PRE-IRRADIATION MAX.	POST-IRRADIATION (3×10^{14} nvt $>$ 10 keV) MIN.	POST-IRRADIATION TYP.	POST-IRRADIATION MAX.	UNITS	TEST CONDITIONS	
t_{on}	**Turn On Time** (Note 5, Figure 1)		6.0	15		**8.0**	**25**	ns	$I_C \approx 30$ mA	$I_{B1} \approx 6.0$ mA
t_{off}	**Turn Off Time** (Note 5, Figure 1)		18	35		**15**	**35**	ns	$I_C \approx 30$ mA	$I_{B1} \approx 6.0$ mA, $I_{B2} \approx -6.0$ mA
τ_s	Charge Storage Time Constant (Note 6, Figure 2)		15	20		5.0	20	ns	$I_C \approx 10$ mA	$I_{B1} \approx 10$ mA, $I_{B2} \approx -10$ mA
$V_{CE(sat)}$	Pulsed Collector Saturation Voltage (Note 6)		−0.06	−0.12		−0.113	−0.24	Volts	$I_C = 10$ mA	$I_B = 2.0$ mA
$V_{CE(sat)}$	Pulsed Collector Saturation Voltage (Note 6)		−0.12	−0.19		−0.212	−0.4	Volts	$I_C = 30$ mA	$I_B = 6.0$ mA
$V_{CE(sat)}$	**Pulsed Collector Saturation Voltage** (Note 6)		−0.28	−0.44		**−0.367**	**−0.65**	**Volts**	$I_C = 100$ mA	$I_B = 20$ mA
$V_{BE(sat)}$	Pulsed Base Saturation Voltage (Note 6)	−0.78	−0.82	−0.92	−0.78	−0.83	−0.95	Volts	$I_C = 10$ mA	$I_B = 2.0$ mA
$V_{BE(sat)}$	Pulsed Base Saturation Voltage (Note 6)	−0.85	−0.93	−1.2	−0.85	−0.93	−1.2	Volts	$I_C = 30$ mA	$I_B = 6.0$ mA
$V_{BE(sat)}$	Pulsed Base Saturation Voltage	−1.0	−1.14	−1.6	−1.0	−1.14	−1.75	Volts	$I_C = 100$ mA	$I_B = 20$ mA
h_{fe}	**High Frequency Current Gain (f = 100 MHz)**	8.0	12		**6.0**	**10**			$I_C = 30$ mA	$V_{CE} = -10$ V
C_{cb}	**Collector to Base Capacitance (f = 1.0 MHz)**		2.2	4.5		**2.2**	**4.5**	**pF**	$I_E = 0$	$V_{CB} = -5.0$ V
C_{eb}	Emitter to Base Capacitance (f = 1.0 MHz)		4.0	6.0		4.0	6.0	pF	$I_C = 0$	$V_{EB} = -0.5$ V
h_{FE}	DC Pulse Current Gain (Note 6)	30	53		6.0	12.4			$I_C = 10$ mA	$V_{CE} = -0.3$ V
h_{FE}	DC Pulse Current Gain (Note 6)	40	63	100	10	15.2			$I_C = 30$ mA	$V_{CE} = -0.5$ V
h_{FE}	DC Pulse Current Gain (Note 6)	30	55		8.0	13.9			$I_C = 100$ mA	$V_{CE} = -1.0$ V
$h_{FE}(-55°C)$	DC Pulse Current Gain (Note 6)	20	38		5.0	8.6			$I_C = 30$ mA	$V_{CE} = -0.5$ V
I_{CES}	Collector Reverse Current		0.05	1.0		0.3	10	nA	$V_{BE} = 0$	$V_{CE} = -10$ V
$I_{CES}(125°C)$	Collector Reverse Current		0.01	10		0.5	20	μA	$V_{BE} = 0$	$V_{CE} = -10$ V
$V_{CEO(sus)}$	Collector to Emitter Sustaining Voltage (Notes 4 and 6)	−12	−16		−12	−17.7		Volts	$I_C = 10$ mA	$I_B = 0$
BV_{CBO}	Collector to Base Breakdown Voltage	−12	−24		−12	−24.3		Volts	$I_C = 10$ μA	$I_E = 0$
BV_{CES}	Collector to Emitter Breakdown Voltage	−12	−23		−12	−23.3		Volts	$I_C = 10$ μA	$V_{BE} = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	−4.5	−5.4		−4.5	−5.4		Volts	$I_C = 0$	$I_E = 100$ μA

*Fairchild is a patented Fairchild process.

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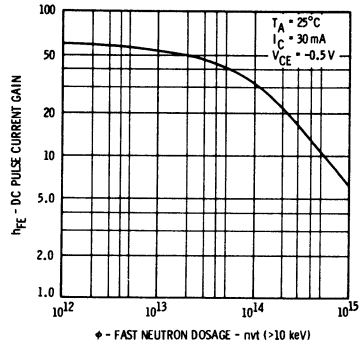
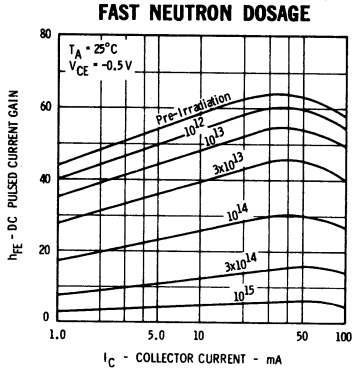
TYPICAL ELECTRICAL CHARACTERISTICS

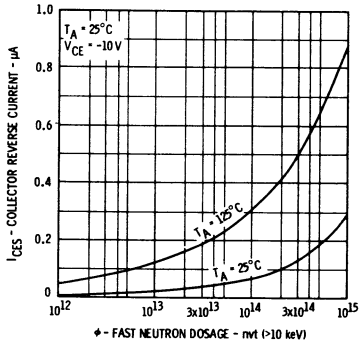
DC PULSE CURRENT GAIN VERSUS FAST NEUTRON DOSAGE



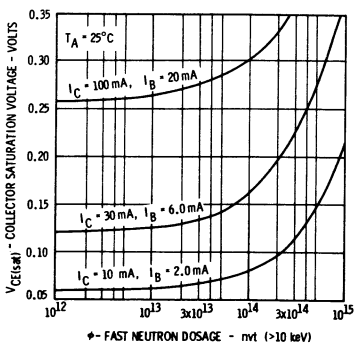
DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT FAST NEUTRON DOSAGE



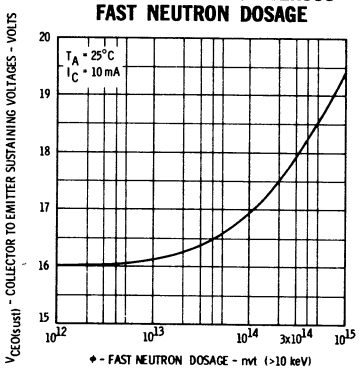
COLLECTOR TO EMITTER CURRENT VERSUS FAST NEUTRON DOSAGE



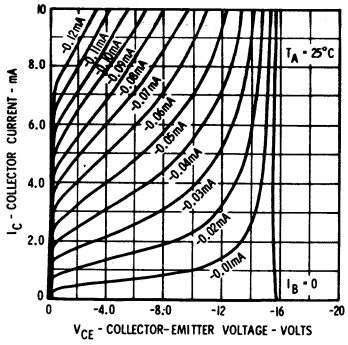
COLLECTOR SATURATION VOLTAGE VERSUS FAST NEUTRON DOSAGE



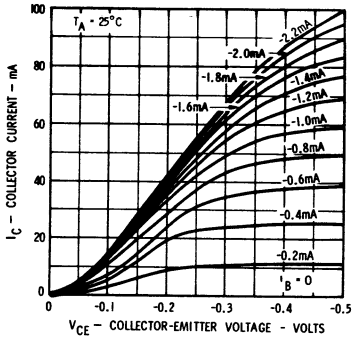
COLLECTOR TO EMITTER SUSTAINING VOLTAGE VERSUS FAST NEUTRON DOSAGE



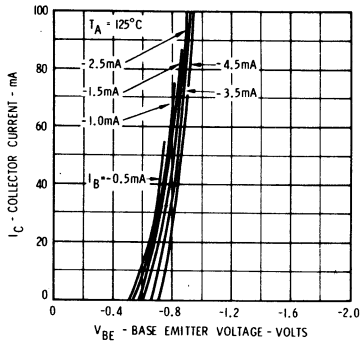
COLLECTOR CHARACTERISTICS*



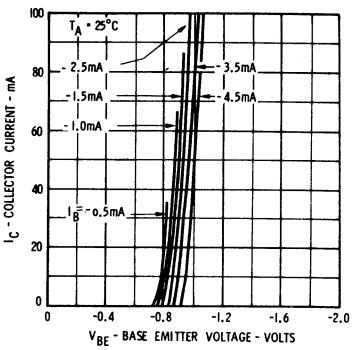
COLLECTOR CHARACTERISTICS*



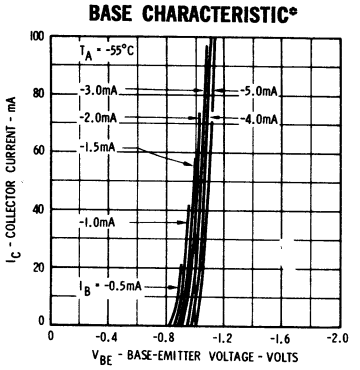
BASE CHARACTERISTIC*



BASE CHARACTERISTIC*



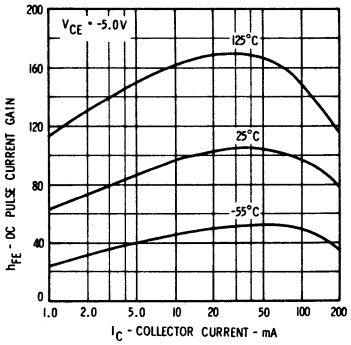
BASE CHARACTERISTIC*



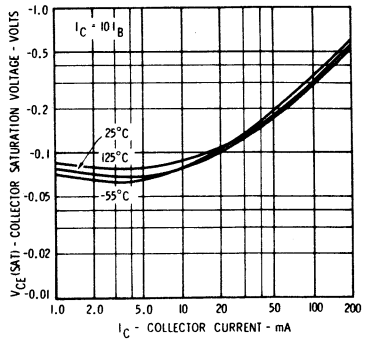
*Single family characteristics on Transistor Curve Tracer.

TYPICAL ELECTRICAL CHARACTERISTICS

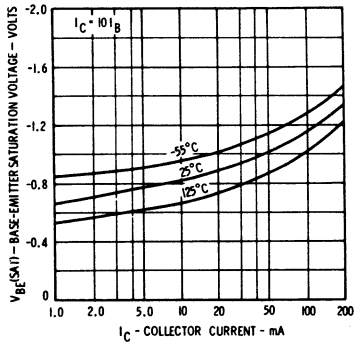
DC PULSE CURRENT GAIN VERSUS COLLECTOR CURRENT



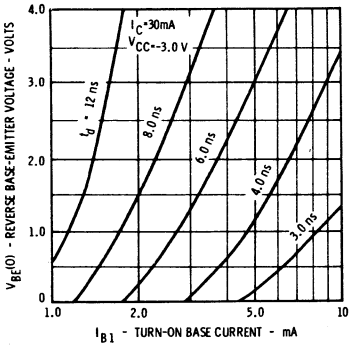
COLLECTOR SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



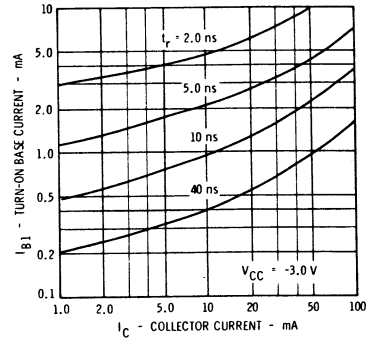
BASE SATURATION VOLTAGE VERSUS COLLECTOR CURRENT



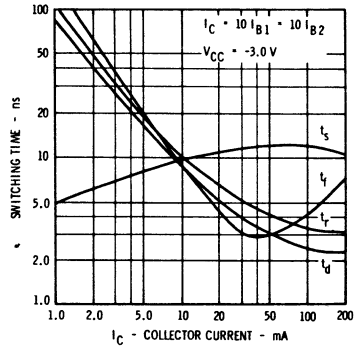
DELAY TIME VERSUS TURN ON BASE CURRENT AND REVERSE BASE EMITTER VOLTAGE



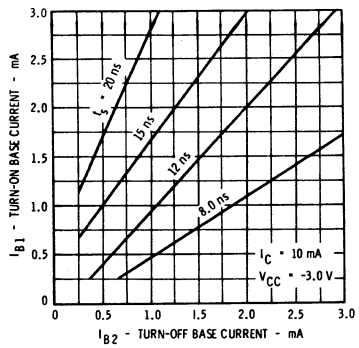
RISE TIME VERSUS COLLECTOR AND TURN ON BASE CURRENTS



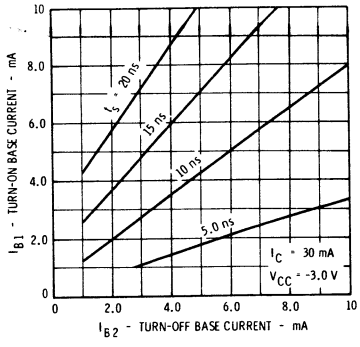
SWITCHING TIMES VERSUS COLLECTOR CURRENT



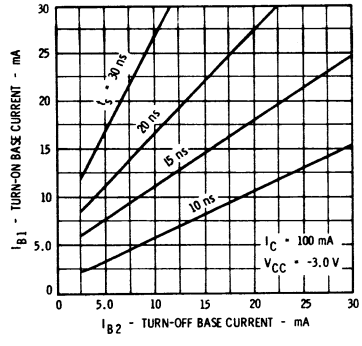
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



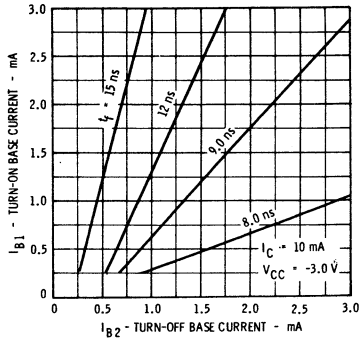
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



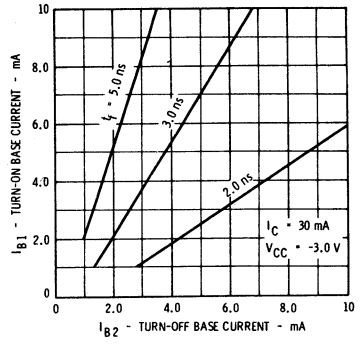
STORAGE TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



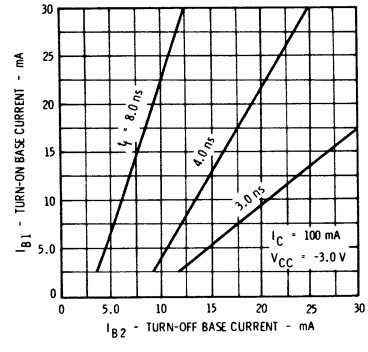
FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS



FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS

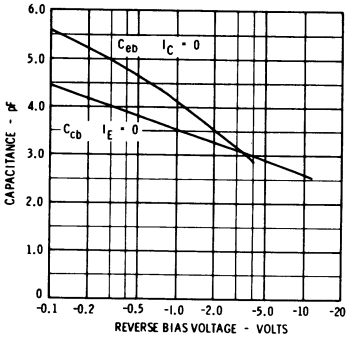


FALL TIME VERSUS TURN ON AND TURN OFF BASE CURRENTS

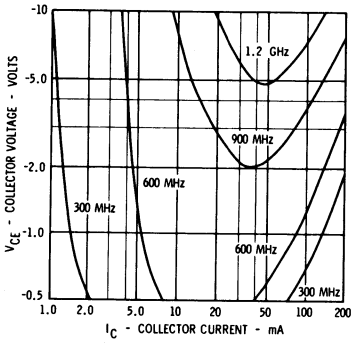


TYPICAL ELECTRICAL CHARACTERISTICS

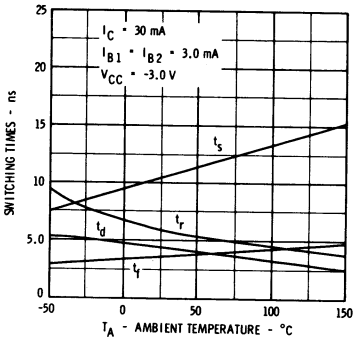
INPUT AND OUTPUT CAPACITANCE VERSUS REVERSE BIAS VOLTAGE



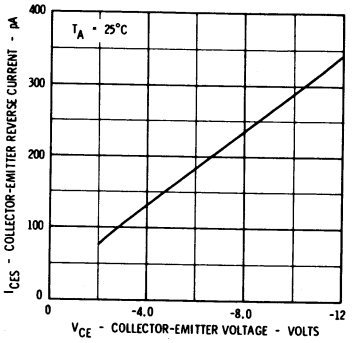
CONTOURS OF CONSTANT GAIN BANDWIDTH PRODUCT (f_T)



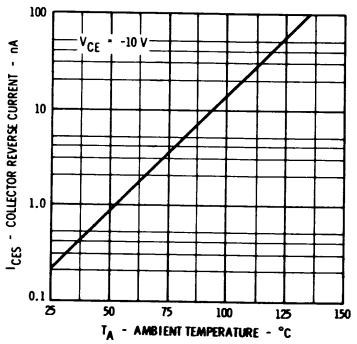
SWITCHING TIMES VERSUS TEMPERATURE



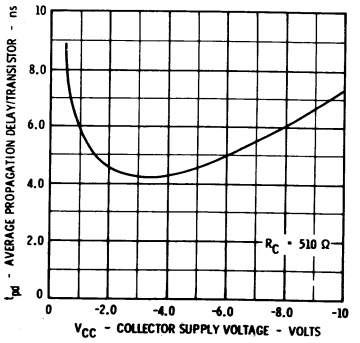
COLLECTOR-EMITTER REVERSE CURRENT VERSUS REVERSE BIAS VOLTAGE



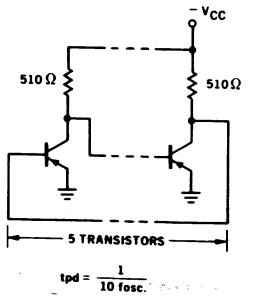
COLLECTOR REVERSE CURRENT VERSUS TEMPERATURE



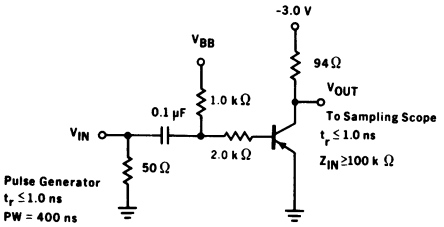
AVERAGE PROPAGATION DELAY PER TRANSISTOR VERSUS COLLECTOR VOLTAGE



FIVE STAGE RING OSCILLATOR FOR MEASUREMENT OF PROPAGATION DELAY



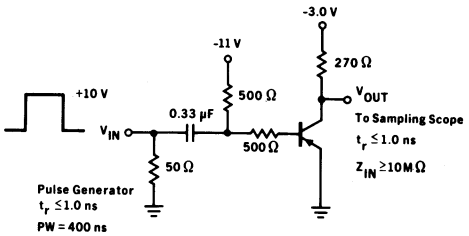
SWITCHING TIME TEST CIRCUIT FIGURE 1



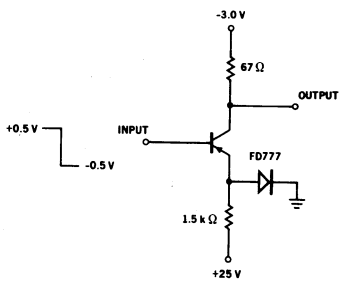
t_{on} V_{BB} = 0, V_{IN} = -12.8 V

t_{off} V_{BB} = -18.8 V, V_{IN} = +23.5 V

STORAGE TIME TEST CIRCUIT FIGURE 2



NON SATURATED SWITCHING PERFORMANCE



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 175°C/Watt (derating factor of 5.71 mW/°C); junction to ambient thermal resistance of 486°C/Watt (derating factor of 2.06 mW/°C).
(4) This rating refers to a high current point where collector to emitter voltage is lowest.
(5) See switching circuit for exact values of I_C, I_{B1}, and I_{B2}.
(6) Pulse Conditions: length = 300 μs; duty cycle = 1%.