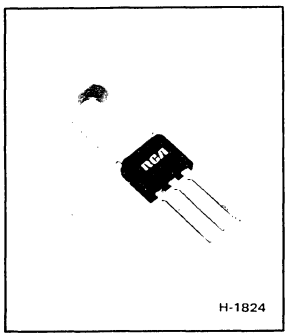
RCA Solid State Division

Power Transistors RCP701, RCP703, RCP705, RCP707 Series



General-Purpose, Medium-Power Silicon N-P-N Planar Transistors

For Large-Signal Applications

$V_{CEO(sus)}$ (V) \ h_{FE}	At V_{CE} = 4 V, I_C = 500 mA			
	50–250	30–150	50 min.	20 min.
100	RCP701D	RCP703D	–	–
80	RCP701C	RCP703C	–	–
60	RCP701B	RCP703B	RCP705B	RCP707B
40	RCP701A	RCP703A	–	–
30	–	–	RCP705	RCP707

Features

- Maximum safe-area-of-operation curves specified for dc operation
- Planar construction for low noise and low leakage
- High gain at high current
- Fast switching time
- Thermal-cycling ratings
- N-P-N complements of p-n-p types in RCP700, RCP702, RCP704, and RCP706 series

The RCP701–, RCP703–, RCP705–, and RCP707–series power transistors are double-diffused, epitaxial-planar silicon p-n-p transistors. They are intended for a wide variety of large-signal, general-purpose applications such as complementary vertical deflection, TV sound output, regulators, and driver and output stages of audio amplifiers. They are the n-p-n complements of the p-n-p devices in the RCP700, RCP702, RCP704, and RCP706 series*. These devices are supplied in a molded plastic package.

* See bulletin File No. 821 for data for the RCP700–, RCP702–, RCP704–, and RCP706–series devices.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

		RCP701D RCP703D	RCP701C RCP703C	RCP701B RCP703B	RCP701A RCP703A	RCP705B RCP707B	RCP705 RCP707	
COLLECTOR-TO-BASE VOLTAGE	V_{CBO}	125	105	85	55	85	45	V
COLLECTOR-TO-EMITTER SUSTAINING VOLTAGE:								
With base open	$V_{CEO(sus)}$	100	80	60	40	60	30	V
EMITTER-TO-BASE VOLTAGE	V_{EBO}	7	7	7	7	5.5	5.5	V
CONTINUOUS COLLECTOR CURRENT	I_C	2	2	2	2	2	2	A
CONTINUOUS BASE CURRENT	I_B	1	1	1	1	1	1	A
TRANSISTOR DISSIPATION:	P_T							
At case temperatures up to 25°C		10	10	10	10	10	10	W
At ambient temperatures up to 25°C		1.75	1.75	1.75	1.75	1.75	1.75	W
At case temperatures above 25°C		Derate linearly 0.08 W/°C						
At ambient temperatures above 25°C		Derate linearly 0.014 W/°C						
TEMPERATURE RANGE:								
Storage & Operating (Junction)		−65 to +150						°C
PIN TEMPERATURE (During Soldering)								
At distances ≥ 1/8 in. (3.17 mm) from seating plane for 10 s max		230						°C

ELECTRICAL CHARACTERISTICS, *At Case Temperature (T_C) = 25°C*

CHARACTERISTIC	SYMBOL	TEST CONDITIONS					LIMITS				UNITS
		VOLTAGE V dc			CURRENT mA dc		RCP701D		RCP701C		
		V_{CB}	V_{CE}	V_{BE}	I_C	I_B	Min.	Max.	Min.	Max.	
Collector Cutoff Current: With emitter open	I_{CBO}	105 85					– –	0.5 –	– –	– 0.5	μA
With base open	I_{CEO}		75 60			0 0	– –	100 –	– –	– 100	μA
With base-emitter junction reverse-biased	I_{CEV}		125 105	–1.5 –1.5			– –	100 –	– –	– 100	μA
Emitter Cutoff Current	I_{EBO}			–7	0		–	100	–	100	μA
DC Forward-Current Transfer Ratio	h_{FE}		4 4		500[a] 1000[a]		50 10	250 –	50 10	250 –	
Collector-to-Emitter Sustaining Voltage: With base open[b]	$V_{CEO(sus)}$				100[a]	0	100	–	80	–	V
Base-to-Emitter Saturation Voltage	$V_{BE(sat)}$				500[a]	50	–	1.2	–	1.2	V
Base-to-Emitter Voltage	V_{BE}		4		500[a]		–	1.1	–	1.1	V
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$				500[a]	50	–	0.8	–	0.8	V
Magnitude of Common-Emitter, Small-Signal, Short-Circuit, Forward-Current Transfer Ratio: f = 10 MHz	$\lvert h_{fe} \rvert$		4		50		5	–	5	–	
Gain-Bandwidth Product	f_T		4		50		50	–	50	–	MHz
Second-Breakdown Collector Current: With base forward-biased and t = 50 ms	$I_{S/b}$		50				200	–	200	–	mA
Output Capacitance: f = 1 MHz	C_{obo}	10					8	20	8	20	pF
Saturated Switching Time (V_{CC} = 30 V, $I_{B1} = I_{B2}$): Turn-on ($t_d + t_r$)	t_{ON}				500	50	–	80	–	80	ns
Turn-off ($t_s + t_f$)	t_{OFF}				500	50	–	800	–	800	ns
Thermal Resistance: Junction-to-case	$R_{\theta JC}$						–	12.5	–	12.5	°C/W
Junction-to-ambient	$R_{\theta JA}$						–	71.4	–	71.4	°C/W

[a] Pulsed, pulse duration = 300 μs, duty factor ≤ 2%.

[b] ***CAUTION:*** Sustaining voltage, V_{CEO}(sus), MUST NOT be measured on a curve tracer.

ELECTRICAL CHARACTERISTICS, *At Case Temperature (T_C) = 25°C*

CHARACTERISTIC	SYMBOL	TEST CONDITIONS					LIMITS				UNITS
		VOLTAGE V dc			CURRENT mA dc		RCP701B		RCP701A		
		V_{CB}	V_{CE}	V_{BE}	I_C	I_B	Min.	Max.	Min.	Max.	
Collector Cutoff Current: With emitter open	I_{CBO}	70 50					– –	0.5 –	– –	– 0.5	μA
With base open	I_{CEO}		45 30			0 0	– –	100 –	– –	– 100	μA
With base-emitter junction reverse-biased	I_{CEV}		85 55	–1.5 –1.5			– –	100 –	– –	– 100	μA
Emitter Cutoff Current	I_{EBO}			–7	0		–	100	–	100	μA
DC Forward-Current Transfer Ratio	h_{FE}		4 4		500[a] 1000[a]		50 10	250 –	50 10	250 –	
Collector-to-Emitter Sustaining Voltage: With base open[b]	$V_{CEO(sus)}$				100[a]	0	60	–	40	–	V
Base-to-Emitter Saturation Voltage	$V_{BE(sat)}$				500[a]	50	–	1.2	–	1.2	V
Base-to-Emitter Voltage	V_{BE}		4		500[a]		–	1.1	–	1.1	V
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$				500[a]	50	–	0.8	–	0.8	V
Magnitude of Common-Emitter, Small-Signal, Short-Circuit, Forward-Current Transfer Ratio: f = 10 MHz	$\lvert h_{fe} \rvert$		4		50		5	–	5	–	
Gain-Bandwidth Product	f_T		4		50		50	–	50	–	MHz
Second-Breakdown Collector Current: With base forward-biased and t = 50 ms	$I_{S/b}$		50 20				200 –	– –	– –	– 500	mA
Output Capacitance: f = 1 MHz	C_{obo}	10					8	20	8	20	pF
Saturated Switching Time (V_{CC} = 30 V, $I_{B1} = I_{B2}$): Turn-on ($t_d + t_r$)	t_{ON}				500	50	–	80	–	80	ns
Turn-off ($t_s + t_f$)	t_{OFF}				500	50	–	800	–	800	
Thermal Resistance: Junction-to-case	$R_{\theta JC}$						–	12.5	–	12.5	°C/W
Junction-to-ambient	$R_{\theta JA}$						–	71.4	–	71.4	

[a] Pulsed, pulse duration = 300 μs, duty factor ≤ 2%.

[b] ***CAUTION:*** Sustaining voltage, $V_{CEO(sus)}$, MUST NOT be measured on a curve tracer.

ELECTRICAL CHARACTERISTICS, *At Case Temperature (T_C) = 25°C*

CHARACTERISTIC	SYMBOL	TEST CONDITIONS					LIMITS				UNITS
		VOLTAGE V dc			CURRENT mA dc		RCP703D		RCP703C		
		V_{CB}	V_{CE}	V_{BE}	I_C	I_B	Min.	Max.	Min.	Max.	
Collector Cutoff Current: With emitter open	I_{CBO}	105 85					– –	0.5 –	– –	– 0.5	μA
With base open	I_{CEO}		75 60			0 0	– –	100 –	– –	– 100	μA
With base-emitter junction reverse-biased	I_{CEV}		125 105	−1.5 −1.5			– –	100 –	– –	– 100	μA
Emitter Cutoff Current	I_{EBO}			−7	0		–	100	–	100	μA
DC Forward-Current Transfer Ratio	h_{FE}		4 4		500[a] 1000[a]		30 10	150 –	30 10	150 –	
Collector-to-Emitter Sustaining Voltage: With base open[b]	$V_{CEO(sus)}$				100[a]	0	100	–	80	–	V
Base-to-Emitter Saturation Voltage	$V_{BE(sat)}$				500[a]	50	–	1.2	–	1.2	V
Base-to-Emitter Voltage	V_{BE}		4		500[a]		–	1.1	–	1.1	V
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$				500[a]	50	–	0.8	–	0.8	V
Magnitude of Common-Emitter, Small-Signal, Short-Circuit, Forward-Current Transfer Ratio: f = 10 MHz	$\lvert h_{fe} \rvert$		4		50		5	–	5	–	
Gain-Bandwidth Product	f_T		4		50		50	–	50	–	MHz
Second-Breakdown Collector Current: With base forward-biased and t = 50 ms	$I_{S/b}$		50				200	–	200	–	mA
Output Capacitance: f = 1 MHz	C_{obo}	10					8	20	8	20	pF
Saturated Switching Time (V_{CC} = 30 V, $I_{B1} = I_{B2}$): Turn-on ($t_d + t_r$)	t_{ON}				500	50	–	80	–	80	ns
Turn-off ($t_s + t_f$)	t_{OFF}				500	50	–	800	–	800	
Thermal Resistance: Junction-to-case	$R_{\theta JC}$						–	12.5	–	12.5	°C/W
Junction-to-ambient	$R_{\theta JA}$						–	71.4	–	71.4	

[a] Pulsed, pulse duration = 300 μs, duty factor ≤ 2%.

[b] *CAUTION:* Sustaining voltage, $V_{CEO(sus)}$, MUST NOT be measured on a curve tracer.

ELECTRICAL CHARACTERISTICS, *At Case Temperature (T_C) = 25°C*

CHARACTERISTIC	SYMBOL	TEST CONDITIONS					LIMITS				UNITS
		VOLTAGE V dc			CURRENT mA dc		RCP703B		RCP703A		
		V_{CB}	V_{CE}	V_{BE}	I_C	I_B	Min.	Max.	Min.	Max.	
Collector Cutoff Current: With emitter open	I_{CBO}	70 50					– –	0.5 –	– –	– 0.5	μA
With base open	I_{CEO}		45 30			0 0	– –	100 –	– –	– 100	μA
With base-emitter junction reverse-biased	I_{CEV}		85 55	–1.5 –1.5			– –	100 –	– –	– 100	μA
Emitter Cutoff Current	I_{EBO}			–7	0		–	100	–	100	μA
DC Forward-Current Transfer Ratio	h_{FE}		4 4		500[a] 1000[a]		30 10	150 –	30 10	150 –	
Collector-to-Emitter Sustaining Voltage: With base open[b]	$V_{CEO(sus)}$				100[a]	0	60	–	40	–	V
Base-to-Emitter Saturation Voltage	$V_{BE(sat)}$				500[a]	50	–	1.2	–	1.2	V
Base-to-Emitter Voltage	V_{BE}		4		500[a]		–	1.1	–	1.1	V
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$				500[a]	50	–	0.8	–	0.8	V
Magnitude of Common-Emitter, Small-Signal, Short-Circuit, Forward-Current Transfer Ratio: f = 10 MHz	$\lvert h_{fe} \rvert$		4		50		5	–	5	–	
Gain-Bandwidth Product	f_T		4		50		50	–	50	–	MHz
Second-Breakdown Collector Current: With base forward-biased and t = 50 ms	$I_{S/b}$		50 20				200 –	– –	– 500	– –	mA
Output Capacitance: f = 1 MHz	C_{obo}	10					8	20	8	20	pF
Saturated Switching Time (V_{CC} = 30 V, $I_{B1} = I_{B2}$): Turn-on ($t_d + t_r$)	t_{ON}				500	50	–	80	–	80	ns
Turn-off ($t_s + t_f$)	t_{OFF}				500	50	–	800	–	800	
Thermal Resistance: Junction-to-case	$R_{\theta JC}$						–	12.5	–	12.5	°C/W
Junction-to-ambient	$R_{\theta JA}$						–	71.4	–	71.4	

[a] Pulsed, pulse duration = 300 μs, duty factor ≤ 2%.

[b] ***CAUTION:*** Sustaining voltage, $V_{CEO(sus)}$, MUST NOT be measured on a curve tracer.

ELECTRICAL CHARACTERISTICS, *At Case Temperature (T_C) = 25°C*

CHARACTERISTIC	SYMBOL	TEST CONDITIONS					LIMITS				UNITS
		VOLTAGE V dc			CURRENT mA dc		RCP705B		RCP705		
		V_{CB}	V_{CE}	V_{BE}	I_C	I_B	Min.	Max.	Min.	Max.	
Collector Cutoff Current: With emitter open	I_{CBO}	70 40					– –	5 –	– –	– 5	μA
With base open	I_{CEO}		45 22			0 0	– –	1000 –	– –	– 1000	μA
With base-emitter junction reverse-biased	I_{CEV}		85 45	–1.5 –1.5			– –	100 –	– –	– 100	μA
Emitter Cutoff Current	I_{EBO}			–5.5	0		–	100	–	100	μA
DC Forward-Current Transfer Ratio	h_{FE}		4		500[a]		50	–	50	–	
Collector-to-Emitter Sustaining Voltage: With base open[b]	$V_{CEO(sus)}$				100[a]	0	60	–	30	–	V
Base-to-Emitter Saturation Voltage	$V_{BE(sat)}$				500[a]	50	–	1.6	–	1.6	V
Base-to-Emitter Voltage	V_{BE}		4		500[a]		–	1.5	–	1.5	V
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$				500[a]	50	–	1.2	–	1.2	V
Magnitude of Common-Emitter, Small-Signal, Short-Circuit, Forward-Current Transfer Ratio: f = 10 MHz	$\lvert h_{fe} \rvert$		4		50		5	–	5	–	
Gain-Bandwidth Product	f_T		4		50		50	–	50	–	MHz
Second-Breakdown Collector Current: With base forward-biased and t = 50 ms	$I_{S/b}$		50 20				120 –	– –	– 500	– –	mA
Output Capacitance: f = 1 MHz	C_{obo}	10					8	20	8	20	pF
Saturated Switching Time (V_{CC} = 30 V, $I_{B1} = I_{B2}$): Turn-on ($t_d + t_r$)	t_{ON}				500	50	–	80	–	80	ns
Turn-off ($t_s + t_f$)	t_{OFF}				500	50	–	800	–	800	
Thermal Resistance: Junction-to-case	$R_{\theta JC}$						–	12.5	–	12.5	°C/W
Junction-to-ambient	$R_{\theta JA}$						–	71.4	–	71.4	

[a] Pulsed, pulse duration = 300 μs, duty factor ≤ 2%.

[b] ***CAUTION:*** Sustaining voltage, $V_{CEO(sus)}$, MUST NOT be measured on a curve tracer.

ELECTRICAL CHARACTERISTICS, *At Case Temperature (T_C) = 25°C*

CHARACTERISTIC	SYMBOL	TEST CONDITIONS					LIMITS				UNITS
		VOLTAGE V dc			CURRENT mA dc		RCP707B		RCP707		
		V_{CB}	V_{CE}	V_{BE}	I_C	I_B	Min.	Max.	Min.	Max.	
Collector Cutoff Current: With emitter open	I_{CBO}	70 40					– –	5 –	– –	– 5	μA
With base open	I_{CEO}		45 22			0 0	– –	1000 –	– –	– 1000	μA
With base-emitter junction reverse-biased	I_{CEV}		85 45	−1.5 −1.5			– –	100 –	– –	– 100	μA
Emitter Cutoff Current	I_{EBO}			−5.5	0		–	100	–	100	μA
DC Forward-Current Transfer Ratio	h_{FE}		4		500[a]		20	–	20	–	
Collector-to-Emitter Sustaining Voltage: With base open[b]	$V_{CEO(sus)}$				100[a]	0	60	–	30	–	V
Base-to-Emitter Saturation Voltage	$V_{BE(sat)}$				500[a]	50	–	1.6	–	1.6	V
Base-to-Emitter Voltage	V_{BE}		4		500[a]		–	1.5	–	1.5	V
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$				500[a]	50	–	1.2	–	1.2	V
Magnitude of Common-Emitter, Small-Signal, Short-Circuit, Forward-Current Transfer Ratio: f = 10 MHz	$\lvert h_{fe} \rvert$		4		50		5	–	5	–	
Gain-Bandwidth Product	f_T		4		50		50	–	50	–	MHz
Second-Breakdown Collector Current: With base forward-biased and t = 50 ms	$I_{S/b}$		50 20				120 –	– –	– 500	– –	mA
Output Capacitance: f = 1 MHz	C_{obo}	10					8	20	8	20	pF
Saturated Switching Time (V_{CC} = 30 V, $I_{B1} = I_{B2}$): Turn-on ($t_d + t_r$)	t_{ON}				500	50	–	80	–	80	ns
Turn-off ($t_s + t_f$)	t_{OFF}				500	50	–	800	–	800	
Thermal Resistance: Junction-to-case	$R_{\theta JC}$						–	12.5	–	12.5	°C/W
Junction-to-ambient	$R_{\theta JA}$						–	71.4	–	71.4	

[a] Pulsed, pulse duration = 300 μs, duty factor ≤ 2%.

[b] ***CAUTION:*** Sustaining voltage, $V_{CEO(sus)}$, MUST NOT be measured on a curve tracer.

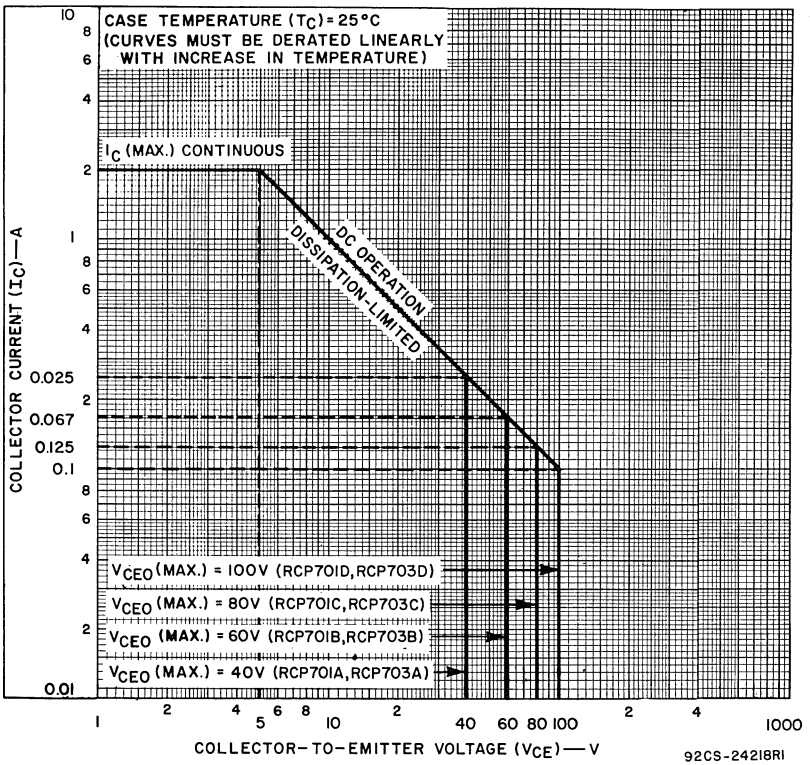


Fig. 1 — Maximum operating for RCP701A — RCP701D, and RCP703A — RCP703D.

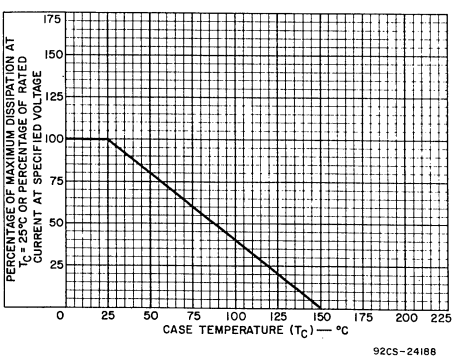


Fig. 2 — Dissipation derating curve for all types.

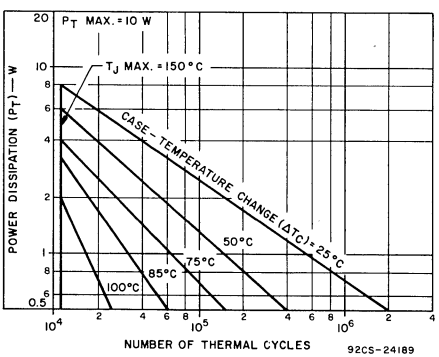


Fig. 3 — Thermal-cycling rating chart for all types.

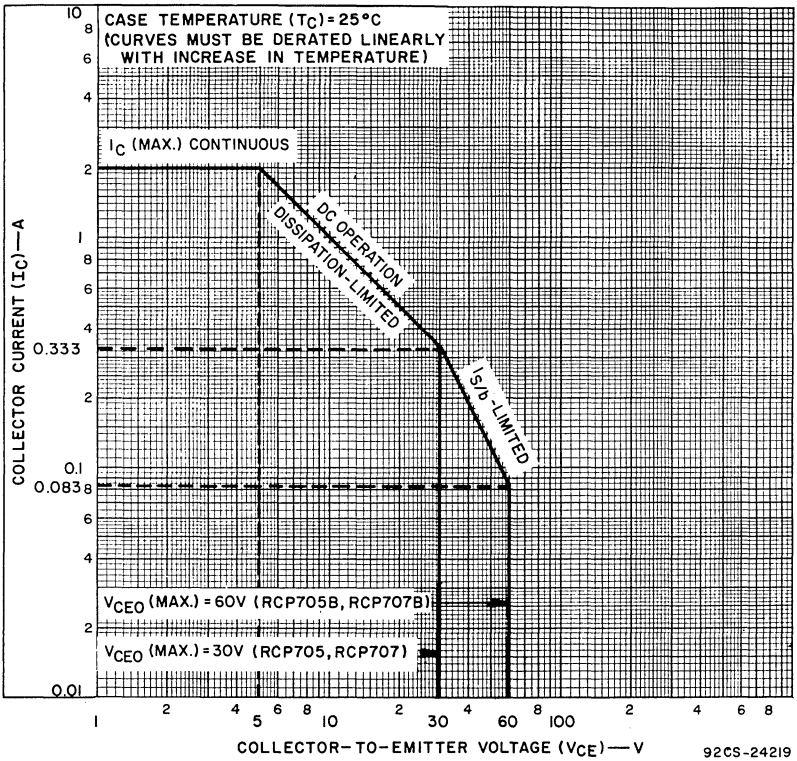


Fig. 4 — Maximum operating areas for RCP705, RCP705B, RCP707 and RCP707B.

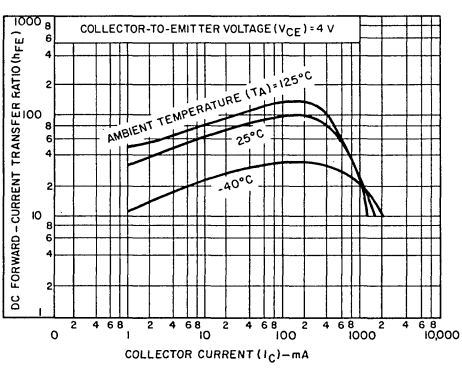


Fig. 5 — Typical static beta characteristics for all types.

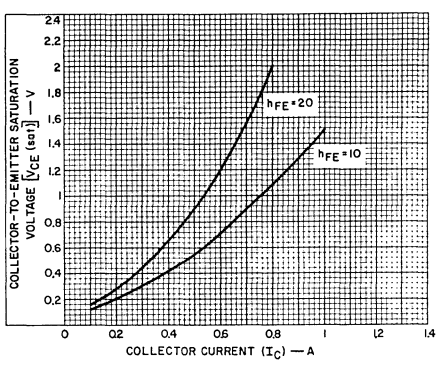


Fig. 6 — Typical saturation-voltage characteristics for all types.

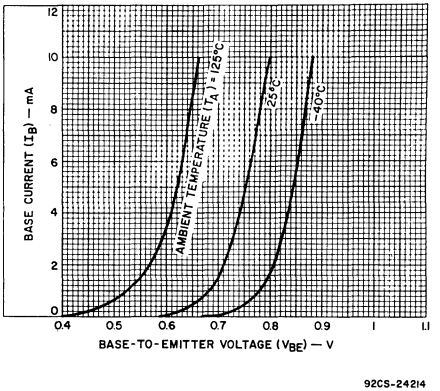


Fig. 7 — Typical input characteristics for all types.

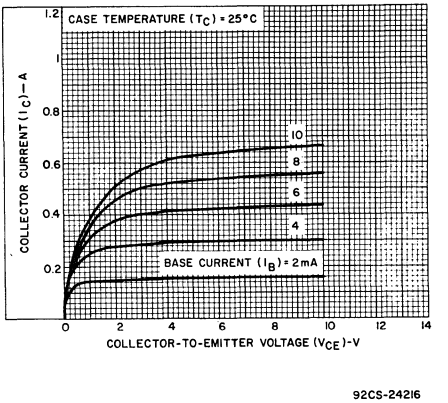


Fig. 8 — Typical output characteristics for all types.

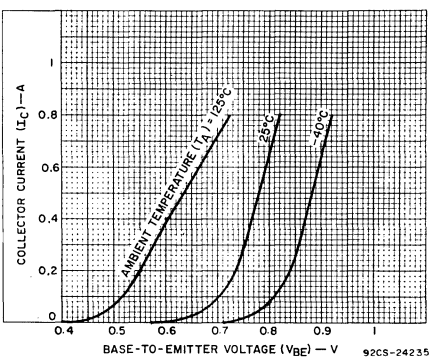


Fig. 9 — Typical transfer characteristics for all types.

TERMINAL CONNECTIONS

Terminal No. 1 — Emitter
Terminal No. 2 — Base
Terminal No. 3 — Collector
Terminal No. 4 — Collector