

2N6542, 2N6544, 2N6545, 2N6546

File Number 1096

3-, 5-, and 10-A Power-Switching Transistors

High-Voltage N-P-N Type for Off-Line Power Supplies and Other
High-Voltage Switching Applications

Features:

- 100% High Temperature Tested for 100°C Parameters
- Fast Switching Speed
- High voltage rating
 $V_{CEX} = 350\text{ V}$
 $= 450\text{ V [2N6545]}$
- Low $V_{CE[sat]}$ at $I_C = 3\text{-}, 5\text{-},$ and 10-A

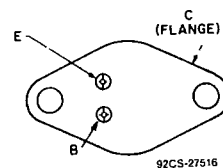
Applications:

- Off-Line Power Supplies
- High Voltage Inverters
- Switching Regulators

The RCA-2N6542, 2N6544, 2N6545, and 2N6546 series of silicon n-p-n power transistors feature high-voltage capability, fast switching speeds, and low saturation voltages, together with high safe-operating area (SOA) ratings. They are specially designed for off-line power supplies, converter circuits and pulse-width-modulated regulators. These high-voltage, high-speed transistors are 100-percent tested for parameters that are essential to the design of high-power switching circuits. Switching times, including inductive turn-off time, and saturation voltages are characterized at 100°C; as well as at 25°C, to provide information necessary for worst-case design.

The 2N6542, 2N6544, 2N6545, and 2N6546 transistors are supplied in steel JEDEC TO-204AA hermetic packages.

TERMINAL DESIGNATIONS



JEDEC TO-204AA

MAXIMUM RATINGS, Absolute-Maximum Values:

	2N6542	2N6544	2N6545	2N6546	
* V_{CEV}					V
$V_{BE} = -1.5\text{ V}$	650	650	850	650	
* V_{CEX} (Clamped)					V
$V_{BE} = -1.5\text{ V}$	350	350	450	350	
* V_{CEO}	300	300	400	300	V
* V_{EBO}			8		V
$I_C(sat)$	3	5	5	10	A
* I_C	5	8	8	15	A
* I_{CM}	10	16	16	30	A
* I_B	5	8	8	10	A
* P_T					W
T_C up to 25°C	100	125	125	175	
T_C above 25°C, derate linearly	0.57	0.714	0.714	1	W/°C
* $T_{sig. T_J}$		-65 to 200			°C
* T_L					
At distance $\geq 1/8$ in. (3.17 mm) from seating plane for 5 s max.		275			°C

* In accordance with JEDEC registration data.

2N6542, 2N6544, 2N6545, 2N6546

ELECTRICAL CHARACTERISTICS $T_c = 25^\circ\text{C}$

CHARACTERISTIC	TEST CONDITIONS				LIMITS								UNITS
	VOLTAGE V dc		CURRENT A dc		2N6542		2N6544		2N6545		2N6546		
	VCE	VBE	IC	IB	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
ICEV	650 850	-1.5 -1.5	— —	— —	— —	0.5 —	— —	0.5 —	— —	— 0.5	— —	1 —	mA
IEBO	—	-8	0	—	—	1	—	1	—	1	—	1	
VCEO(sus) ^b	—	—	0.1 ^a	—	300	—	300	—	400	—	300	—	V
hFE	2	—	3 ^a	—	7	35	—	—	—	—	—	—	
	2	—	1.5 ^a	—	12	60	—	—	—	—	—	—	
	3	—	5 ^a	—	—	—	7	35	7	35	—	—	
	3	—	2.5 ^a	—	—	—	12	60	12	60	—	—	
	2	—	10 ^a	—	—	—	—	—	—	—	6	30	
	2	—	5 ^a	—	—	—	—	—	—	—	12	60	
VBE(sat)	—	—	3 ^a	0.6	—	1.4	—	—	—	—	—	—	V
	—	—	5 ^a	1	—	—	—	1.6	—	1.6	—	—	
	—	—	10 ^a	2	—	—	—	—	—	—	—	1.6	
VCE(sat)	—	—	3 ^a	0.6	—	1	—	—	—	—	—	—	V
	—	—	5 ^a	1	—	5	—	1.5	—	1.5	—	—	
	—	—	8 ^a	2	—	—	—	5	—	5	—	—	
	—	—	10 ^a	2	—	—	—	—	—	—	—	1.5	
	—	—	15 ^a	3	—	—	—	—	—	—	—	5	
IS/b t = 1 s	100	—	—	—	0.2	—	0.2	—	0.2	—	0.2	—	A
fr f = 1 MHz	10	—	0.2	—	6	28	—	—	—	—	—	—	MHz
	10	—	0.3	—	—	—	6	28	6	28	—	—	
	10	—	0.5	—	—	—	—	—	—	—	6	28	
Cobo f = 1 MHz	10 ^d	—	—	—	50	200	75	300	75	300	125	500	pF
td ^{e,g}	—	—	3	0.6	—	0.05	—	—	—	—	—	—	μ S
	—	—	5	1	—	—	—	0.05	—	0.05	—	—	
	—	—	10	2	—	—	—	—	—	—	—	0.05	
tr ^{e,g}	—	—	3	0.6	—	0.7	—	—	—	—	—	—	
	—	—	5	1	—	—	—	1	—	1	—	—	
	—	—	10	2	—	—	—	—	—	—	—	1	
ts ^{e,g}	—	—	3	0.6	—	4	—	—	—	—	—	—	
	—	—	5	1	—	—	—	4	—	4	—	—	
	—	—	10	2	—	—	—	—	—	—	—	4	
tr ^{e,g}	—	—	3	0.6	—	0.8	—	—	—	—	—	—	
	—	—	5	1	—	—	—	1	—	1	—	—	
	—	—	10	2	—	—	—	—	—	—	—	—	

* In accordance with JEDEC registration data.

2N6542, 2N6544, 2N6545, 2N6546

ELECTRICAL CHARACTERISTICS $T_C = 100^\circ\text{C}$

CHARACTERISTIC	TEST CONDITIONS				LIMITS								UNITS	
	VOLTAGE V dc		CURRENT A dc		2N6542		2N6544		2N6545		2N6546			
	VCE	VBE	IC	IB	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.		
* ICEV	650 850	-1.5 -1.5	— —	— —	— —	2.5 —	— —	2.5 —	— —	— 2.5	— —	4 —	mA	
* ICER RBE = 50 Ω	650 850	— —	— —	— —	— —	3 —	— —	3 —	— —	— 3	— —	5 —		
* VCEX(sus) ^{b,c} VCC = 20 V L = 180 μH, RC = 0.05 Ω Vclamp = Rated VCEX	— — —	— — —	2.6 ^a 4.5 ^a 8 ^a	— — —	350 — —	— — —	— 350 —	— — —	— 450 —	— — —	— — 350	— — —	V	
Vclamp = Rated VCEO — 100 V	— — —	— — —	5 ^a 8 ^a 15 ^a	— — —	200 — —	— — —	— 200 —	— — —	— 300 —	— — —	— — 200	— — —		
* VBE(sat)	— — —	— — —	3 ^a 5 ^a 10 ^a	0.6 1 2	— — —	1.4 — —	— — —	— 1.6 —	— — —	— 1.6 —	— — —	— — 1.6		V
* VCE(sat)	— — —	— — —	3 ^a 5 ^a 10 ^a	0.6 1 2	— — —	2 — —	— — —	— 2.5 —	— — —	— 2.5 —	— — —	— — 2.5		
* ts ^{f,g}	— — —	-5 -5 -5	3 5 10	0.6 1 2	— — —	4 — —	— — —	— 4 —	— — —	— 4 —	— — —	— — 5	μS	
* tr ^{f,g}	— — —	-5 -5 -5	3 5 10	0.6 1 2	— — —	0.8 — —	— — —	— 0.9 —	— — —	— 0.9 —	— — —	— — 1.5		
* RθJC	—	—	—	—	—	1.75	—	1.4	—	1.4	—	1		°C/W

* In accordance with JEDEC registration data.

^a Pulsed: pulse duration = 300 μs , duty factor $\leq 2\%$.

^b CAUTION: The sustaining voltage VCEX(sus) and VCEX(sus) MUST NOT be measured on a curve tracer.

^c VCC = 20 V, L = 180 μH , RC = 0.05 Ω
^d VCB value

^e Resistive load, VCC = 250 V, tp = 100 μs , IB1 = -IB2

^f Inductive load, Vclamp = Rated VCEX(sus), IB1 = -IC/5, L = 180 μH , RC = 0.05 Ω , VCC = 20 V

^g For switching speed test methods, see Application Note AN-6820.

The graph shows the relationship between collector current (I_C) and collector-to-emitter voltage (V_{CE}) for the 2N6542 transistor. The y-axis represents collector current in amperes (A) on a logarithmic scale from 0.01 to 20. The x-axis represents collector-to-emitter voltage in volts (V) on a logarithmic scale from 1 to 1000. Key features include:

- PULSED OPERATION***: Indicated at the top of the graph.
- I_C (MAX.) PULSED**: The uppermost curve, labeled with pulse widths of 100 μ s, 200 μ s, 500 μ s, 1 ms, and 5 ms.
- I_C (MAX.) CONTINUOUS**: The curve below the pulsed limit.
- DC OPERATION DISSIPATION-LIMITED**: The region between the pulsed and continuous current limits.
- 150° LIMITED**: A diagonal line indicating the thermal limit for 150°C.
- 300V**: A label near the end of the 150° limited line.
- CASE TEMPERATURE (T_C) = 25° C**: A note stating that curves must be derated linearly with increase in temperature.
- * FOR SINGLE NONREPETITIVE PULSE**: A note for pulsed operation.
- V_{CE0} (MAX.) 300V (2N6542)**: The maximum collector-to-emitter voltage for the device.

Graph showing Collector Current (I_C) versus Collector-to-Emitter Voltage (V_{CE}) for 2N6544 and 2N6545 tubes. The graph is plotted on a log-log scale.

Y-axis: COLLECTOR CURRENT (I_C)—A (log scale, 0.01 to 20).

X-axis: COLLECTOR-TO-EMITTER VOLTAGE (V_{CE})—V (log scale, 1 to 1000).

Annotations:

- I_C (MAX.) PULSED
- I_C (MAX.) CONTINUOUS
- DC OPERATION DISSIPATION-LIMITED
- PULSED OPERATION *
- * FOR SINGLE NONREPETITIVE PULSE
- CASE TEMPERATURE (T_C) = 25°C
- CURVES MUST BE DERATED LINEARLY WITH INCREASE IN TEMPERATURE
- V_{CE0} (MAX.) 300 V (2N6544)
- V_{CE0} (MAX.) 400 V (2N6545)
- Pulse width curves: 100 μ s, 100 ms, 500 μ s, 1 ms, 5 ms, 150 μ s LIMITED

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205

2N6542, 2N6544, 2N6545, 2N6546

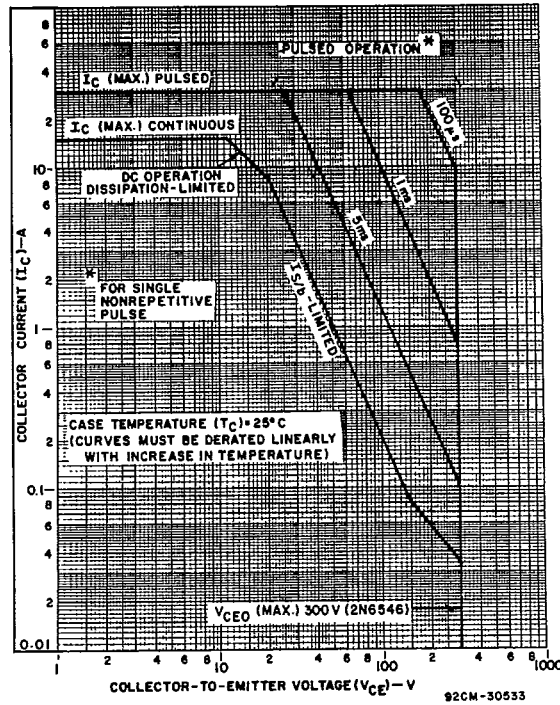


Fig. 3 - Maximum operating areas for type 2N6546 ($T_c = 25^\circ$)

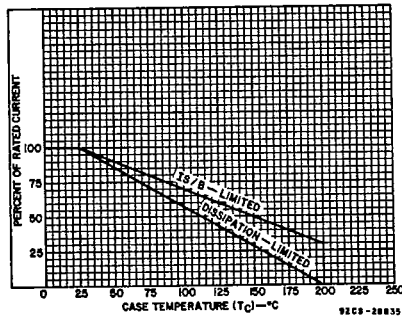


Fig. 4 - Dissipation and $I_{s/B}$ derating curves for all types.

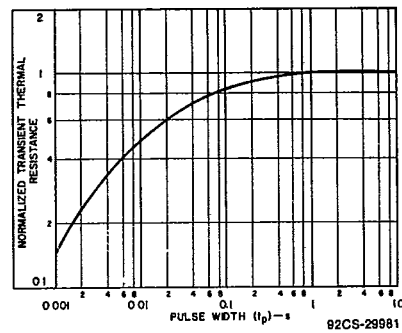


Fig. 5 - Typical thermal-response characteristics for types 2N6542, 2N6544 and 2N6545.

2N6542, 2N6544, 2N6545, 2N6546

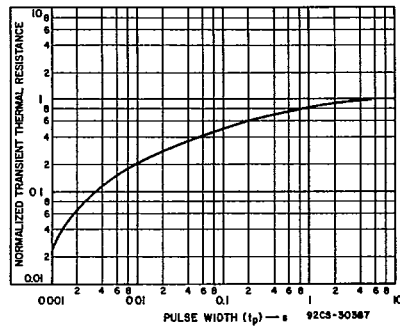


Fig. 6 — Typical thermal-response characteristics for type 2N6546.

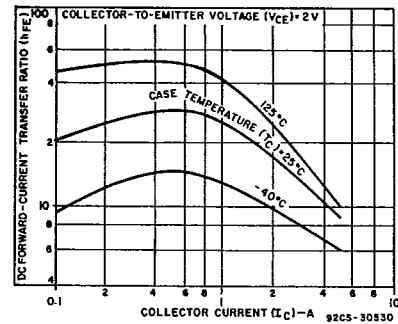


Fig. 7 — Typical dc beta characteristics for type 2N6542.

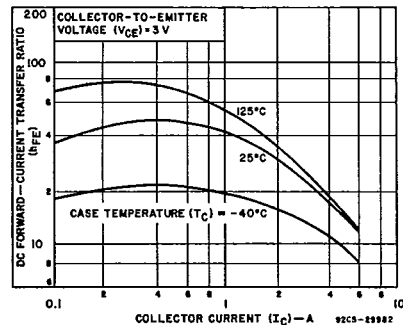


Fig. 8 — Typical dc beta characteristics for type 2N6544.

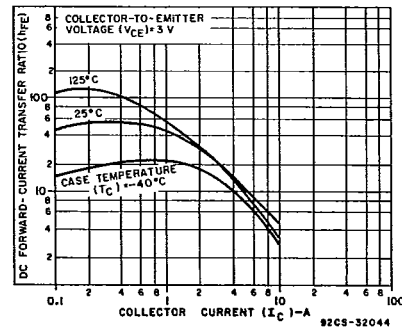


Fig. 9 — Typical dc beta characteristics for type 2N6545.

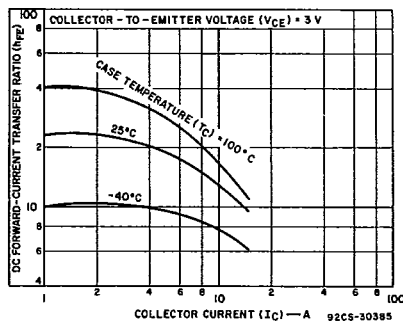


Fig. 10 — Typical dc beta characteristics for type 2N6546.

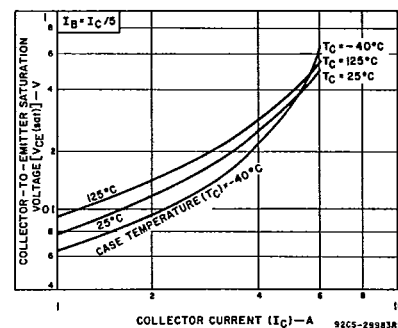


Fig. 11 — Typical collector-to-emitter saturation voltage as a function of collector current for types 2N6542 and 2N6544.

2N6542, 2N6544, 2N6545, 2N6546

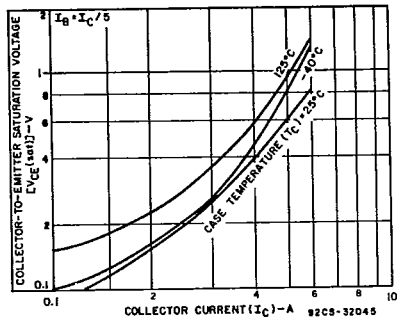


Fig. 12 — Typical collector-to-emitter saturation voltage as a function of collector current for type 2N6545.

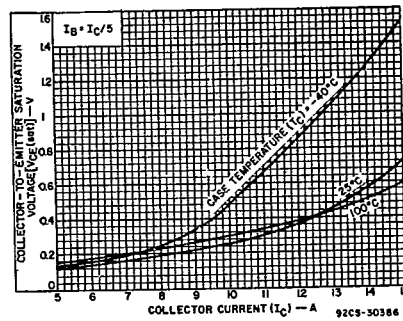


Fig. 13 — Typical collector-to-emitter saturation voltage characteristics for type 2N6546.

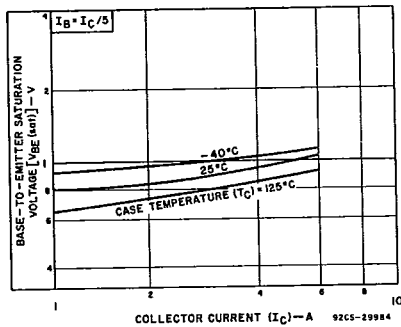


Fig. 14 — Typical base-to-emitter saturation voltage as a function of collector current for types 2N6542 and 2N6544.

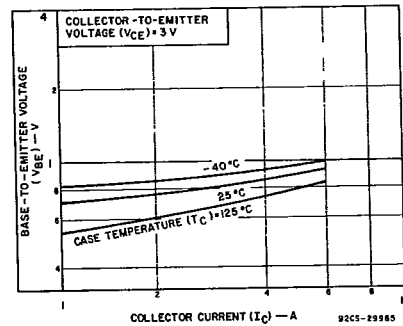


Fig. 15 — Typical base-to-emitter voltage as a function of collector current for types 2N6542 and 2N6544.

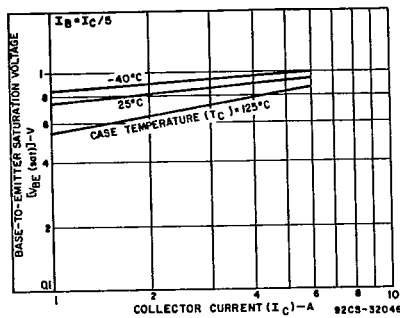


Fig. 16 — Typical base-to-emitter saturation voltage as a function of collector current for type 2N6545.

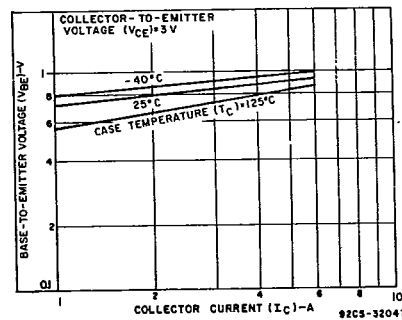


Fig. 17 — Typical base-to-emitter voltage as a function of collector current for type 2N6545.

2N6542, 2N6544, 2N6545, 2N6546

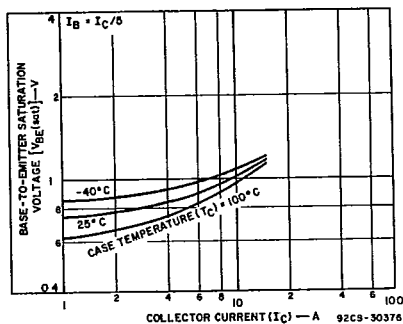


Fig. 18 — Typical base-to-emitter saturation voltage characteristics for type 2N6546.

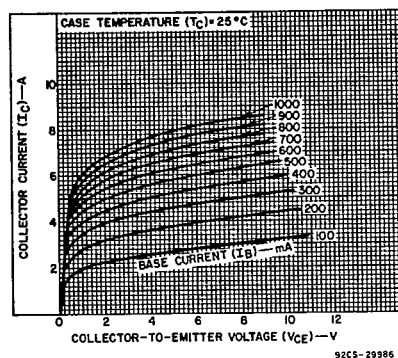


Fig. 19 — Typical output characteristics for types 2N6542 and 2N6544.

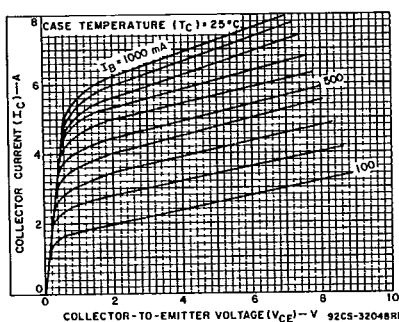


Fig. 20 — Typical output characteristics for type 2N6545.

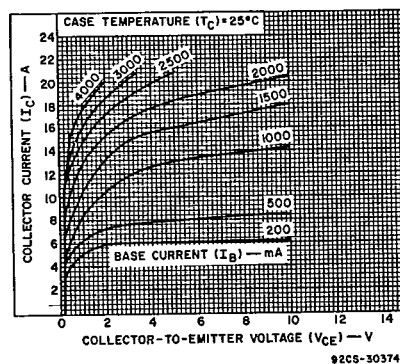


Fig. 21 — Typical output characteristics for type 2N6546.

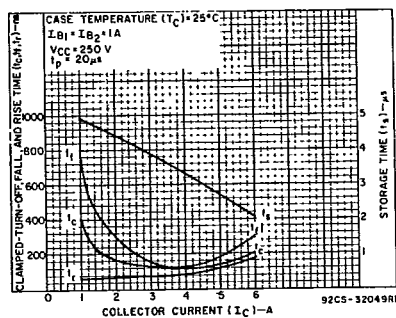


Fig. 22 — Typical saturated switching time characteristics for type 2N6545.

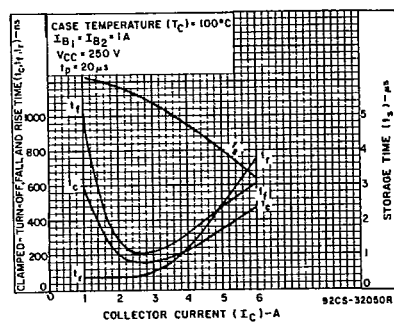


Fig. 23 — Typical saturated switching time characteristics for type 2N6545.

2N6542, 2N6544, 2N6545, 2N6546

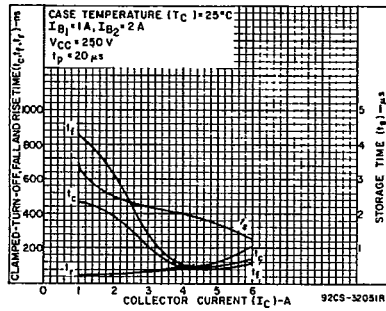


Fig. 24 — Typical saturated switching time characteristics for type 2N6545.

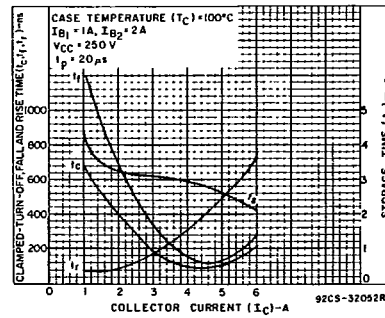


Fig. 25 — Typical saturated switching time characteristics for type 2N6545.

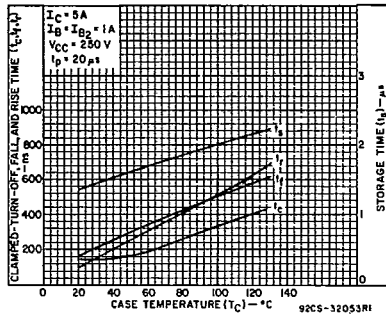


Fig. 26 — Typical saturated switching time characteristics as a function of case temperature for type 2N6545.

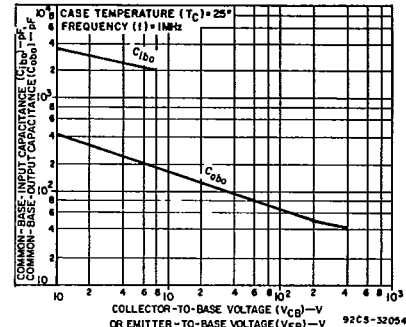


Fig. 27 — Typical common-base input or output capacitance characteristics as a function of collector-to-base voltage or emitter-to-base voltage for type 2N6545.