

### 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  $I_C = 3\text{-}, 5\text{-}, \text{ and } 10\text{-A}$

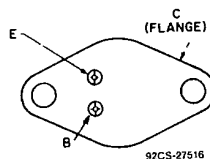
**Applications:**

- 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	
* $V_{CEV}$ $V_{BE} = -1.5\text{ V}$ .....	650	650	850	650	V
* $V_{CEX}$ (Clamped) $V_{BE} = -1.5\text{ V}$ .....	350	350	450	350	V
* $V_{CEO}$ .....	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
* $P_T$ $T_C$ up to 25°C .....	100	125	125	175	W
$T_C$ above 25°C, derate linearly .....	0.57	0.714	0.714	1	W/°C
* $T_{stg}, T_J$ .....		-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 Tc = 25°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	-1.5	—	—	—	0.5	—	0.5	—	—	—	1	mA
	850	-1.5	—	—	—	—	—	—	0.5	—	—	—	
* IEBO	—	-8	0	—	—	1	—	1	—	1	—	1	
* VCEO(sus) <sup>b</sup>	—	—	0.1 <sup>a</sup>	—	300	—	300	—	400	—	300	—	V
* hFE	2	—	3 <sup>a</sup>	—	7	35	—	—	—	—	—	—	
	2	—	1.5 <sup>a</sup>	—	12	60	—	—	—	—	—	—	
	3	—	5 <sup>a</sup>	—	—	—	7	35	7	35	—	—	
	3	—	2.5 <sup>a</sup>	—	—	—	12	60	12	60	—	—	
	2	—	10 <sup>a</sup>	—	—	—	—	—	—	—	6	30	
	2	—	5 <sup>a</sup>	—	—	—	—	—	—	—	12	60	
* VBE(sat)	—	—	3 <sup>a</sup>	0.6	—	1.4	—	—	—	—	—	—	V
	—	—	5 <sup>a</sup>	1	—	—	—	1.6	—	1.6	—	—	
	—	—	10 <sup>a</sup>	2	—	—	—	—	—	—	—	1.6	
* VCE(sat)	—	—	3 <sup>a</sup>	0.6	—	1	—	—	—	—	—	—	V
	—	—	5 <sup>a</sup>	1	—	5	—	1.5	—	1.5	—	—	
	—	—	8 <sup>a</sup>	2	—	—	—	5	—	5	—	—	
	—	—	10 <sup>a</sup>	2	—	—	—	—	—	—	—	1.5	
	—	—	15 <sup>a</sup>	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	
* Cobof = 1 MHz	10 <sup>d</sup>	—	—	—	50	200	75	300	75	300	125	500	pF
* td <sup>e,g</sup>	—	—	3	0.6	—	0.05	—	—	—	—	—	—	μS
	—	—	5	1	—	—	—	0.05	—	0.05	—	—	
	—	—	10	2	—	—	—	—	—	—	—	0.05	
* tr <sup>e,g</sup>	—	—	3	0.6	—	0.7	—	—	—	—	—	—	μS
	—	—	5	1	—	—	—	1	—	1	—	—	
	—	—	10	2	—	—	—	—	—	—	—	1	
* ts <sup>e,g</sup>	—	—	3	0.6	—	4	—	—	—	—	—	—	μS
	—	—	5	1	—	—	—	4	—	4	—	—	
	—	—	10	2	—	—	—	—	—	—	—	4	
* tr <sup>e,g</sup>	—	—	3	0.6	—	0.8	—	—	—	—	—	—	μS
	—	—	5	1	—	—	—	1	—	1	—	—	
	—	—	10	2	—	—	—	—	—	—	—	—	

\* In accordance with JEDEC registration data.

**2N6542, 2N6544, 2N6545, 2N6546**

ELECTRICAL CHARACTERISTICS T<sub>c</sub> = 100° 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	-1.5	—	—	—	2.5	—	2.5	—	—	—	4	mA
	850	-1.5	—	—	—	—	—	—	—	2.5	—	—	
• ICER RBE = 50 Ω	650	—	—	—	—	3	—	3	—	—	—	5	mA
	850	—	—	—	—	—	—	—	—	3	—	—	
• VCEX(sus) <sup>b,c</sup> VCC = 20 V L = 180 μH, RC = 0.05 Ω Vclamp = Rated VCEX	—	—	2.6 <sup>a</sup>	—	350	—	—	—	—	—	—	—	V
	—	—	4.5 <sup>a</sup>	—	—	—	350	—	450	—	—	—	
	—	—	8 <sup>a</sup>	—	—	—	—	—	—	—	—	350	
	—	—	—	—	—	—	—	—	—	—	—	—	
• VBE(sat)	—	—	3 <sup>a</sup>	0.6	—	1.4	—	—	—	—	—	—	V
	—	—	5 <sup>a</sup>	1	—	—	—	1.6	—	1.6	—	—	
	—	—	10 <sup>a</sup>	2	—	—	—	—	—	—	—	1.6	
• VCE(sat)	—	—	3 <sup>a</sup>	0.6	—	2	—	—	—	—	—	—	V
	—	—	5 <sup>a</sup>	1	—	—	—	2.5	—	2.5	—	—	
	—	—	10 <sup>a</sup>	2	—	—	—	—	—	—	—	2.5	
• ts <sup>f,g</sup>	—	-5	3	0.6	—	4	—	—	—	—	—	—	μS
	—	-5	5	1	—	—	—	4	—	4	—	—	
	—	-5	10	2	—	—	—	—	—	—	—	5	
• tr <sup>f,g</sup>	—	-5	3	0.6	—	0.8	—	—	—	—	—	—	μS
	—	-5	5	1	—	—	—	0.9	—	0.9	—	—	
	—	-5	10	2	—	—	—	—	—	—	—	1.5	
• RθJC	—	—	—	—	—	1.75	—	1.4	—	1.4	—	1	° C/W

\* In accordance with JEDEC registration data.

<sup>a</sup> Pulsed; pulse duration = 300 μs, duty factory ≤ 2%.

<sup>b</sup> CAUTION: The sustaining voltage VCE0(sus) and VCEX(sus) MUST NOT be measured on a curve tracer.

<sup>c</sup> VCC = 20 V, L = 180 μH, RC = 0.05 Ω

<sup>d</sup> VCB value

<sup>e</sup> Resistive load, VCC = 250 V, tp = 100 μs, IB1 = -IB2

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

<sup>g</sup> For switching speed test methods, see Application Note AN-6820.

2N6542, 2N6544, 2N6545, 2N6546

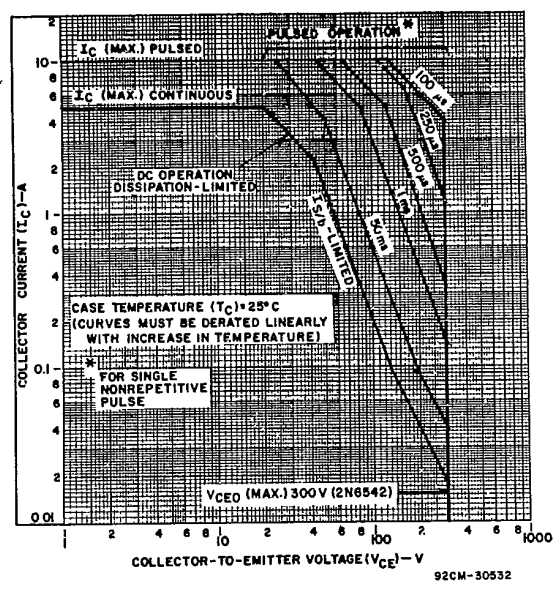


Fig. 1 - Maximum operating areas for type 2N6542 ( $T_c = 25^\circ$ ).

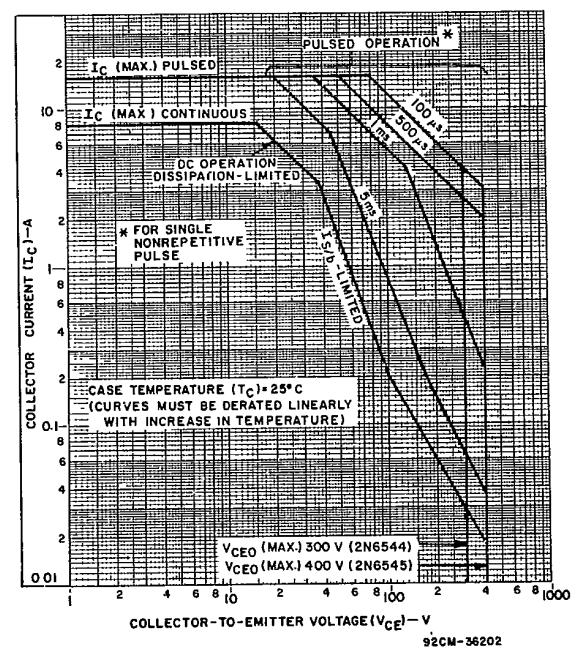


Fig. 2 - Maximum operating areas for type 2N6544 and 2N6545 ( $T_c = 25^\circ$  C).

2N6542, 2N6544, 2N6545, 2N6546

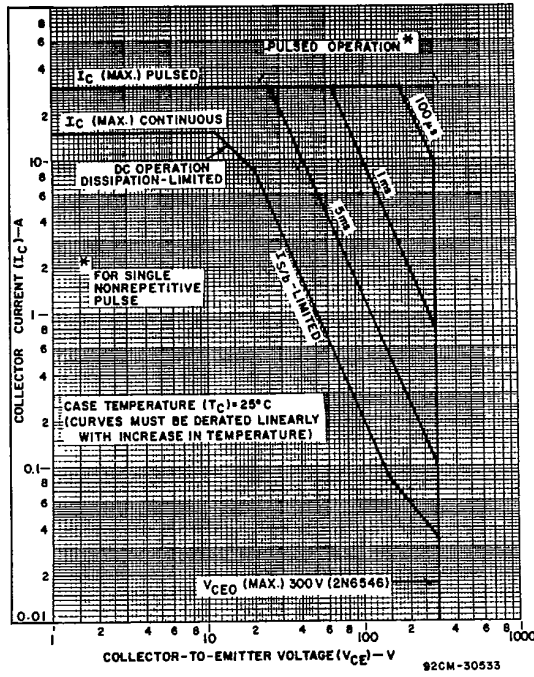


Fig. 3 - Maximum operating areas for type 2N6546 ( $T_c = 25^\circ$ )

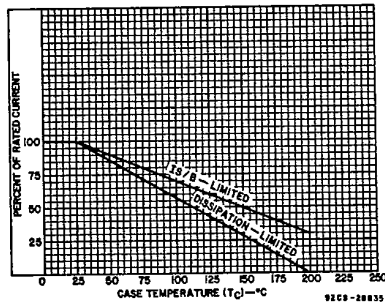


Fig. 4 - Dissipation and  $I_{S/B}$  derating curves for all types.

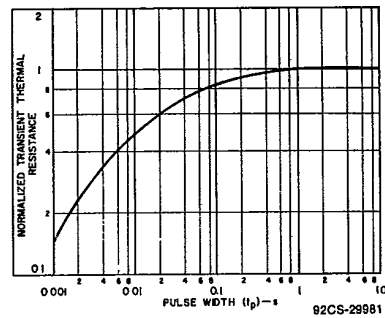


Fig. 5 - Typical thermal-response characteristics for types 2N6542, 2N6544 and 2N6545.

2N6542, 2N6544, 2N6545, 2N6546

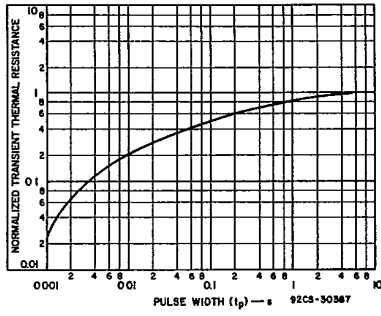


Fig. 6 — Typical thermal-response characteristics for type 2N6546.

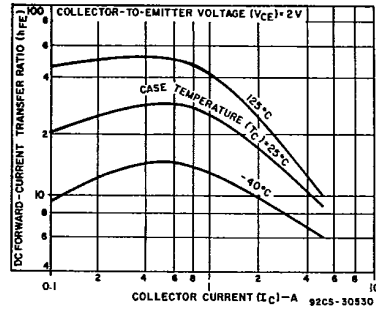


Fig. 7 — Typical dc beta characteristics for type 2N6542.

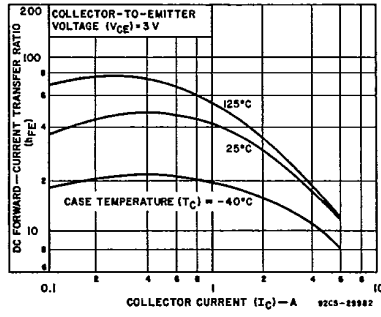


Fig. 8 — Typical dc beta characteristics for type 2N6544.

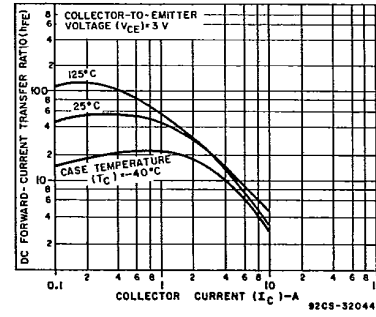


Fig. 9 — Typical dc beta characteristics for type 2N6545.

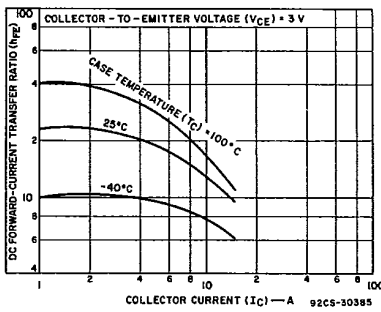


Fig. 10 — Typical dc beta characteristics for type 2N6546.

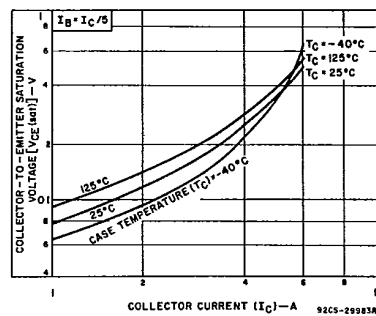


Fig. 11 — Typical collector-to-emitter saturation voltage as a function of collector current for types 2N6542 and 2N6544.

2N6542, 2N6544, 2N6545, 2N6546

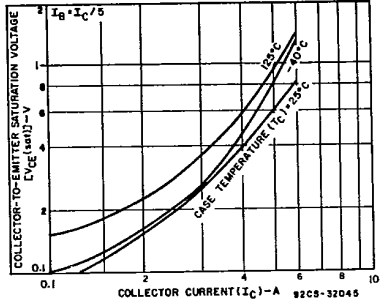


Fig. 12 — Typical collector-to-emitter saturation voltage as a function of collector current for type 2N6545.

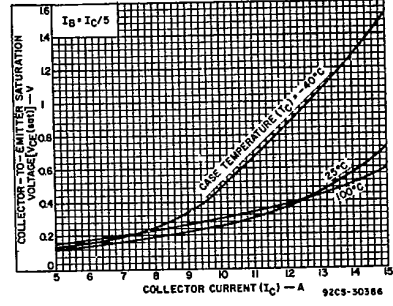


Fig. 13 — Typical collector-to-emitter saturation voltage characteristics for type 2N6546.

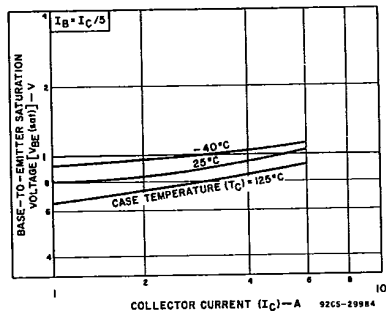


Fig. 14 — Typical base-to-emitter saturation voltage as a function of collector current for types 2N6542 and 2N6544.

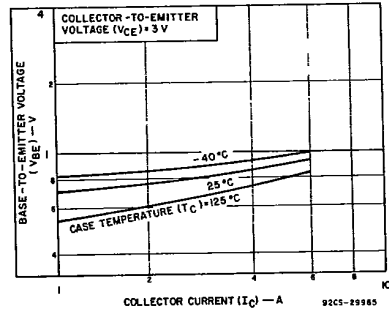


Fig. 15 — Typical base-to-emitter voltage as a function of collector current for types 2N6542 and 2N6544.

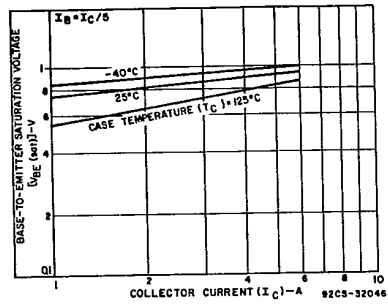


Fig. 16 — Typical base-to-emitter saturation voltage as a function of collector current for type 2N6545.

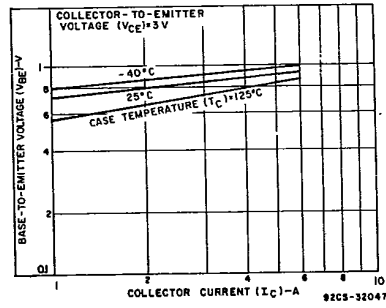


Fig. 17 — Typical base-to-emitter voltage as a function of collector current for type 2N6545.

2N6542, 2N6544, 2N6545, 2N6546

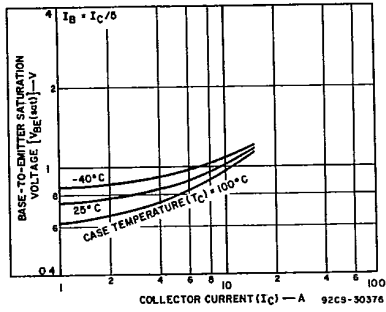


Fig. 18 — Typical base-to-emitter saturation voltage characteristics for type 2N6546.

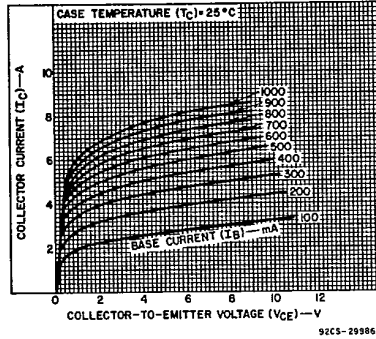


Fig. 19 — Typical output characteristics for types 2N6542 and 2N6544.

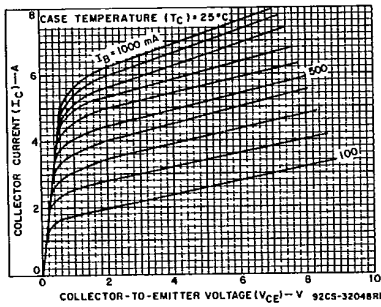


Fig. 20 — Typical output characteristics for type 2N6545.

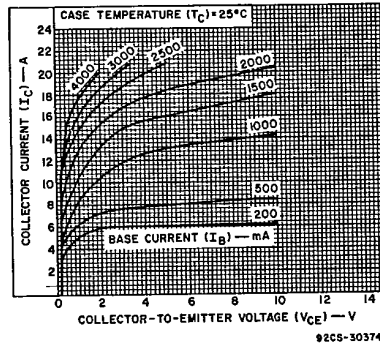


Fig. 21 — Typical output characteristics for type 2N6546.

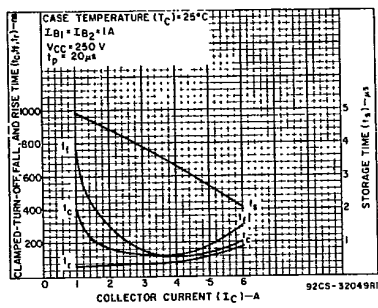


Fig. 22 — Typical saturated switching time characteristics for type 2N6545.

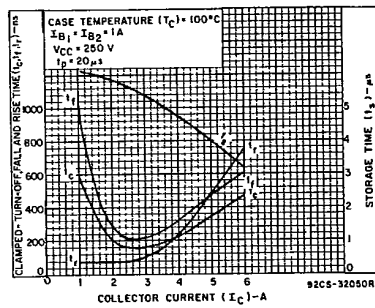


Fig. 23 — Typical saturated switching time characteristics for type 2N6546.



2N6542, 2N6544, 2N6545, 2N6546

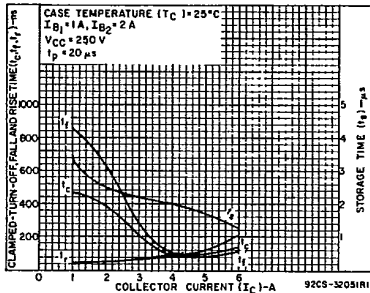


Fig. 24 — Typical saturated switching time characteristics for type 2N6545.

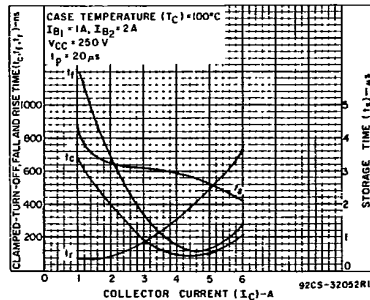


Fig. 25 — Typical saturated switching time characteristics for type 2N6545.

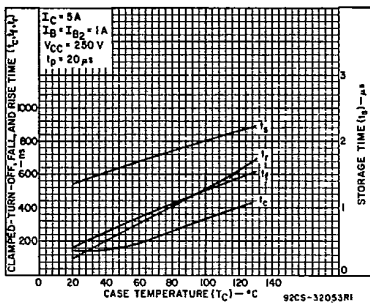


Fig. 26 — Typical saturated switching time characteristics as a function of case temperature for type 2N6545.

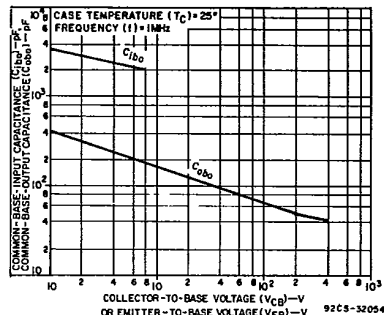


Fig. 27 — Typical common-base input or output capacitance characteristics as a function of collector-to-base voltage or emitter-to-base voltage for type 2N6545.