

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

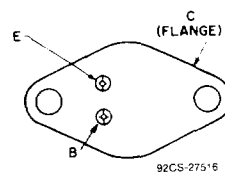
Applications:

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

The 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-per-cent 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}					
$V_{BE} \approx -1.5\text{ V}$	650	650	850	650	V
* V_{CEX} (Clamped)					
$V_{BE} \approx -1.5\text{ V}$	350	350	450	350	V
* V_{CEO}	300	300	400	300	V
* V_{EBO}			8		V
$I_C(\text{sat})$	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) ^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
* ft 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	—	—	—	—	—	—	μS
	—	—	5	1	—	—	—	0.05	—	0.05	—	—	
	—	—	10	2	—	—	—	—	—	—	—	0.05	
* tr ^{e,g}	—	—	3	0.6	—	0.7	—	—	—	—	—	—	μS
	—	—	5	1	—	—	—	1	—	1	—	—	
	—	—	10	2	—	—	—	—	—	—	—	1	
* ts ^{e,g}	—	—	3	0.6	—	4	—	—	—	—	—	—	μS
	—	—	5	1	—	—	—	4	—	4	—	—	
	—	—	10	2	—	—	—	—	—	—	—	4	
* tr ^{e,g}	—	—	3	0.6	—	0.8	—	—	—	—	—	—	μS
	—	—	5	1	—	—	—	1	—	1	—	—	
	—	—	10	2	—	—	—	—	—	—	—	—	

* In accordance with JEDEC registration data.

2
POWER TRANSISTORS

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	-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) ^{b,c} VCC = 20 V L = 180 μH , RC = 0.05 Ω Vclamp = Rated VCEX	—	—	2.6 ^a	—	350	—	—	—	—	—	—	—	V
	—	—	4.5 ^a	—	—	—	350	—	450	—	—	—	
	—	—	8 ^a	—	—	—	—	—	—	—	350	—	
	—	—	8 ^a	—	200	—	—	—	—	—	—	—	
Vclamp = Rated VCEO — 100 V	—	—	5 ^a	—	200	—	—	—	—	—	—	—	V
	—	—	8 ^a	—	—	—	200	—	300	—	—	—	
	—	—	15 ^a	—	—	—	—	—	—	—	200	—	
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	—	2	—	—	—	—	—	—	V
	—	—	5 ^a	1	—	—	—	2.5	—	2.5	—	—	
	—	—	10 ^a	2	—	—	—	—	—	—	—	2.5	
ts ^{f,g}	—	-5	3	0.6	—	4	—	—	—	—	—	—	μS
	—	-5	5	1	—	—	—	4	—	4	—	—	
	—	-5	10	2	—	—	—	—	—	—	—	5	
tf ^{f,g}	—	-5	3	0.6	—	0.8	—	—	—	—	—	—	μS
	—	-5	5	1	—	—	—	0.9	—	0.9	—	—	
	—	-5	10	2	—	—	—	—	—	—	—	1.5	
R θ JC	—	—	—	—	—	1.75	—	1.4	—	1.4	—	1	$^\circ\text{C/W}$

* In accordance with JEDEC registration data.

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

^b CAUTION: The sustaining voltage VCE0(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.

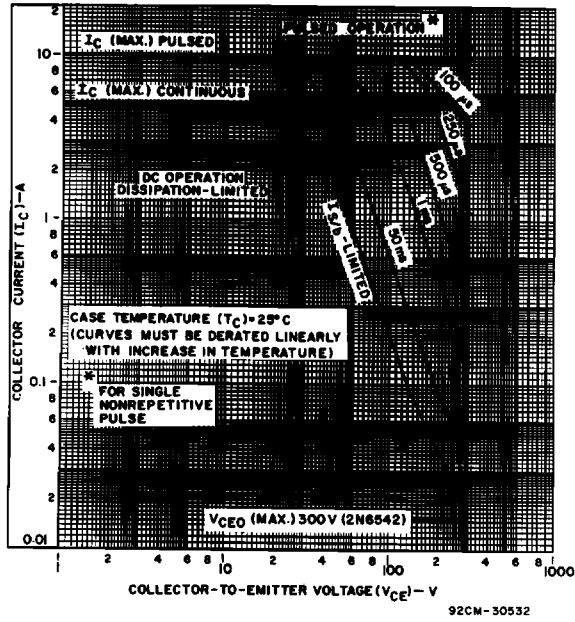


Fig. 1 - Maximum operating areas for type 2N6542 ($T_c = 25^\circ$).

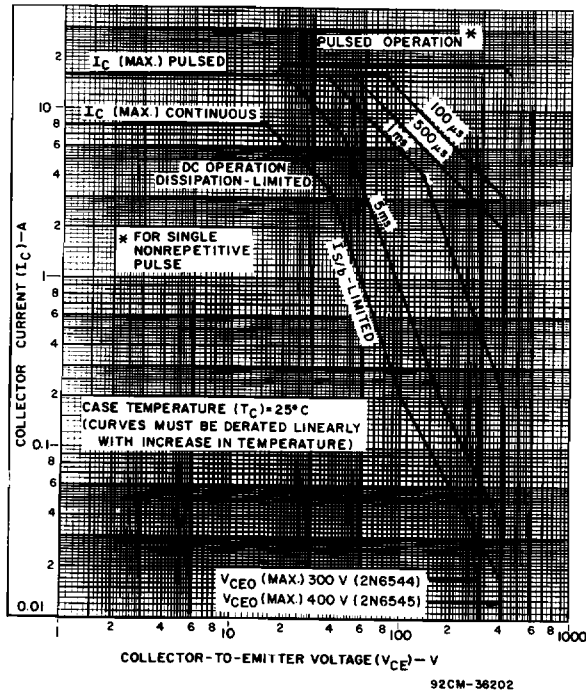


Fig. 2 - Maximum operating areas for type 2N6544 and 2N6545 ($T_c = 25^\circ C$).

2N6542, 2N6544, 2N6545, 2N6546

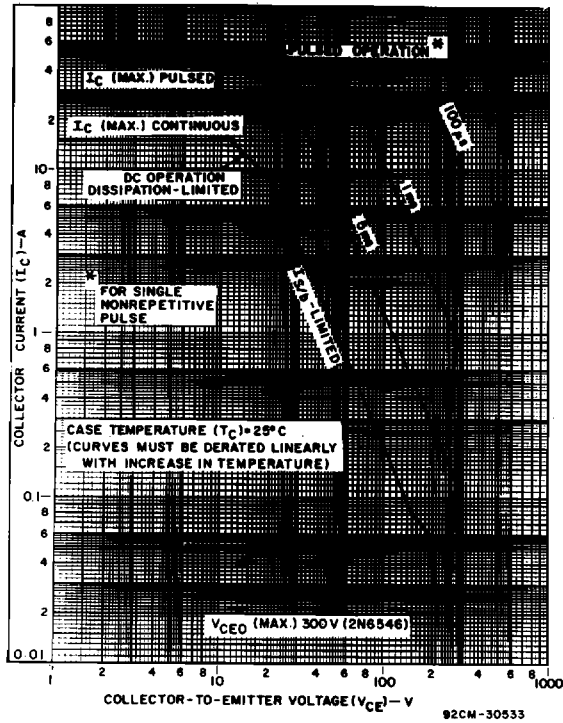


Fig. 3 - Maximum operating areas for type 2N6546 ($T_c = 25^\circ$)

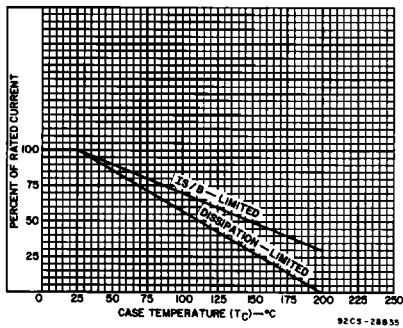


Fig. 4 - Dissipation and $I_{S/b}$ derating curves for all types.

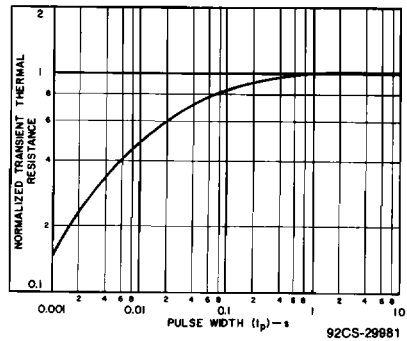


Fig. 5 - Typical thermal-response characteristics for types 2N6542, 2N6544 and 2N6545.

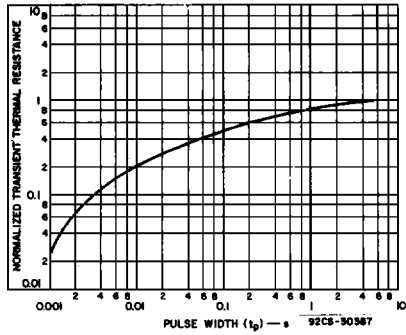


Fig. 6 — Typical thermal-response characteristics for type 2N6546.

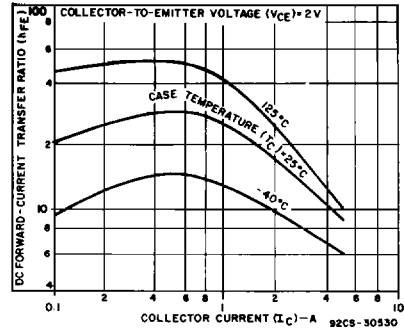


Fig. 7 — Typical dc beta characteristics for type 2N6542.

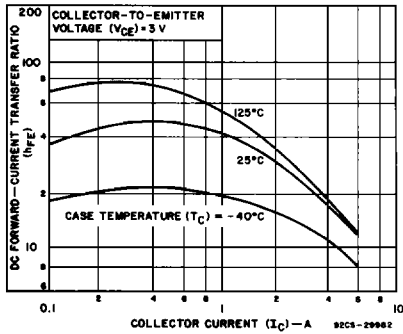


Fig. 8 — Typical dc beta characteristics for type 2N6544.

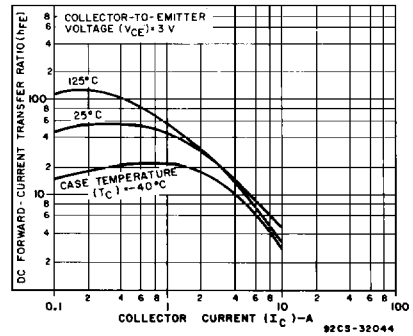


Fig. 9 — Typical dc beta characteristics for type 2N6545.

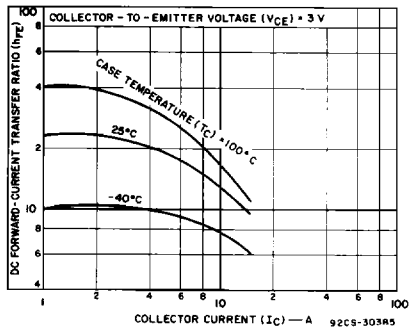


Fig. 10 — Typical dc beta characteristics for type 2N6546.

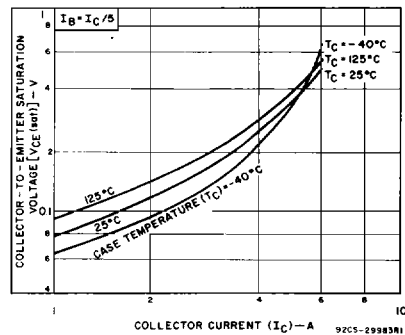


Fig. 11 — Typical collector-to-emitter saturation voltage as a function of collector current for types 2N6542 and 2N6544.

2N6542, 2N6544, 2N6545, 2N6546

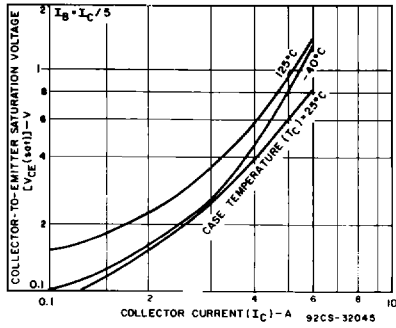


Fig. 12 — Typical collector-to-emitter saturation voltage as a function of collector current for type 2N6545.

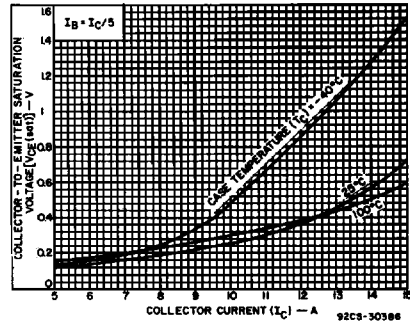


Fig. 13 — Typical collector-to-emitter saturation voltage characteristics for type 2N6546.

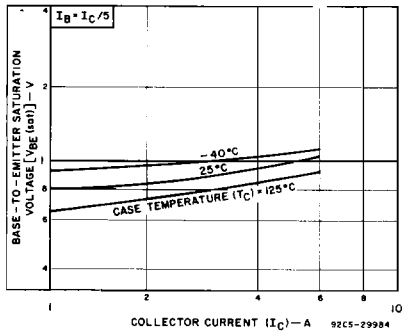


Fig. 14 — Typical base-to-emitter saturation voltage as a function of collector current for types 2N6542 and 2N6544.

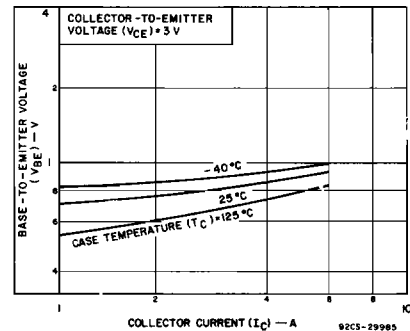


Fig. 15 — Typical base-to-emitter voltage as a function of collector current for types 2N6542 and 2N6544.

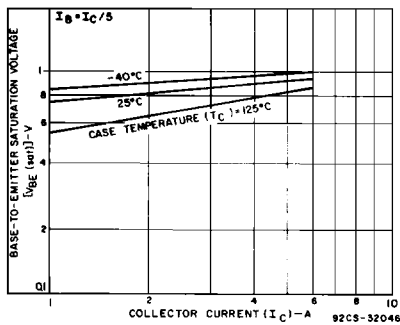


Fig. 16 — Typical base-to-emitter saturation voltage as a function of collector current for type 2N6545.

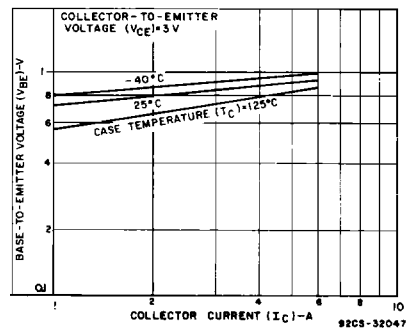


Fig. 17 — Typical base-to-emitter voltage as a function of collector current for type 2N6545.

2N6542, 2N6544, 2N6545, 2N6546

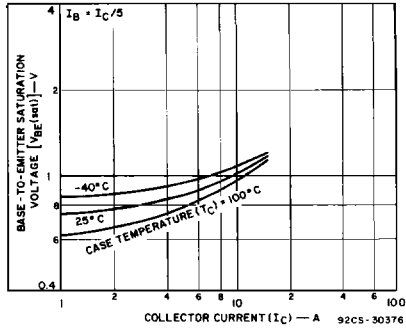


Fig. 18 — Typical base-to-emitter saturation voltage characteristics for type 2N6546.

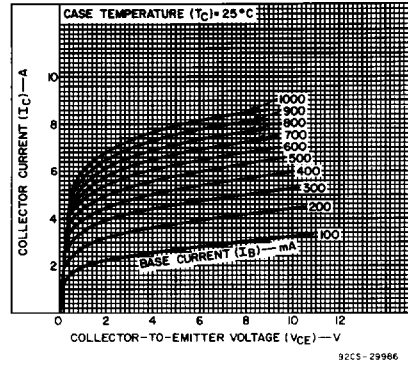


Fig. 19 — Typical output characteristics for types 2N6542 and 2N6544.

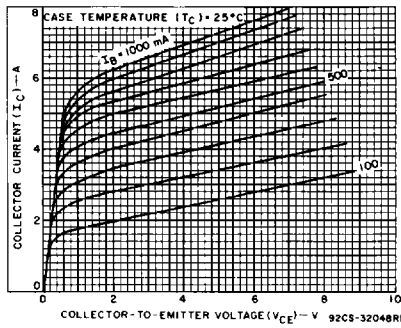


Fig. 20 — Typical output characteristics for type 2N6545.

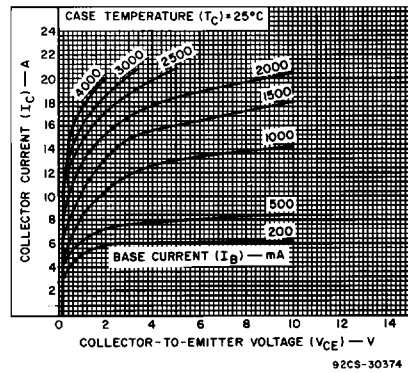


Fig. 21 — Typical output characteristics for type 2N6546.

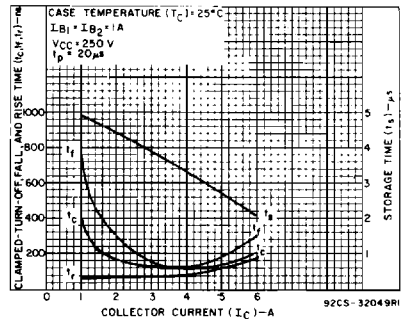


Fig. 22 — Typical saturated switching time characteristics for type 2N6545.

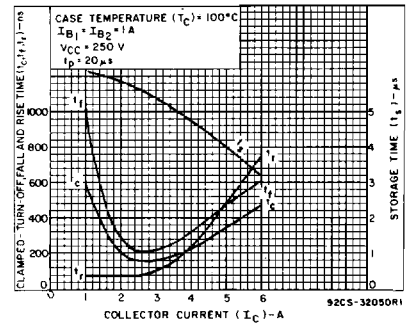


Fig. 23 — Typical saturated switching time characteristics for type 2N6546.

2
POWER TRANSISTORS

2N6542, 2N6544, 2N6545, 2N6546

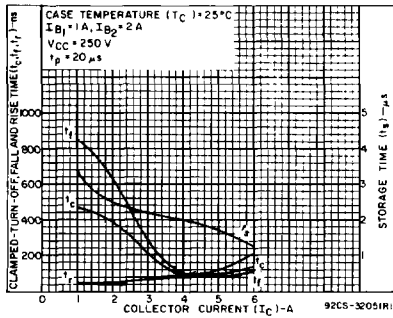


Fig. 24 — Typical saturated switching time characteristics for type 2N6545.

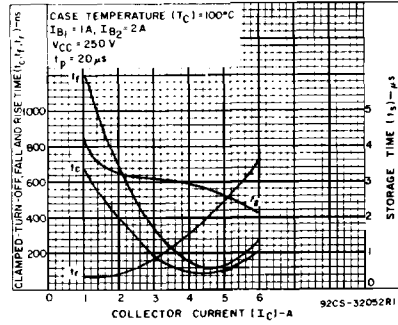


Fig. 25 — Typical saturated switching time characteristics for type 2N6545.

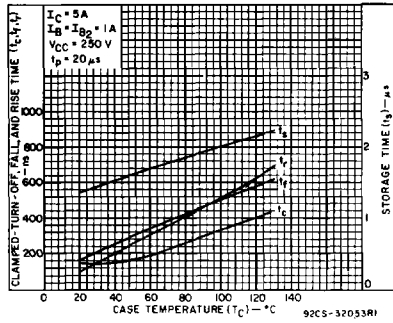


Fig. 26 — Typical saturated switching time characteristics as a function of case temperature for type 2N6545.

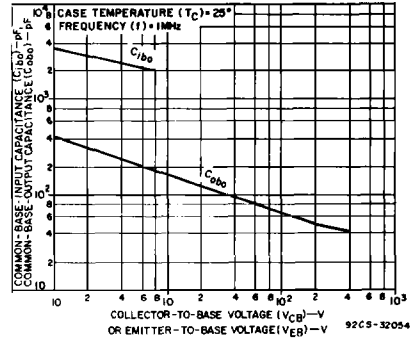


Fig. 27 — Typical common-base input or output capacitance characteristics as a function of collector-to-base voltage or emitter-to-base voltage for type 2N6545.