

2N3583-2N3585, 2N4240

File Number 138

High-Voltage Silicon N-P-N Transistors

For High-Speed Switching and Linear-Amplifier Applications

Features:

- Freedom from second breakdown
- Economy types for ac/dc circuits
- Fast turn-on time at high collector current

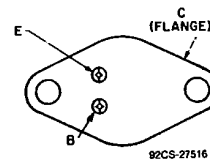
RCA-2N3583*, 2N3584*, 2N3585*, and 2N4240*, are silicon n-p-n transistors with high breakdown voltages and fast switching speeds.

Typical applications for these transistors include high-voltage operational amplifiers, high-voltage switches, switching regulators, converters, inverters, deflection and hi-fi amplifiers.

These transistors are also intended for a wide variety of applications in ac/dc commercial equipment.

All types utilize the JEDEC TO-213AA package.

- *Formerly Dev. Nos. TA2510, TA2511, TA2512, and TA2871 respectively.

TERMINAL DESIGNATIONS**JEDEC TO-213AA****MAXIMUM RATINGS, Absolute-Maximum Values:**

	2N3583	2N3584	2N3585 2N4240	
* COLLECTOR-TO-BASE VOLTAGE, V_{CBO}	250	375	500	V
* COLLECTOR-TO-EMITTER VOLTAGE, Sustaining, $V_{CEO(SUS)}$	175	250	300	V
* EMITTER-TO-BASE VOLTAGE, V_{EBO}	6	6	6	V
* CONTINUOUS COLLECTOR CURRENT, I_C	1	2	2	A
* PEAK COLLECTOR CURRENT	5	5	5	A
* CONTINUOUS BASE CURRENT, I_B	1	1	1	A
* TRANSISTOR DISSIPATION, P_T	35	35	35	W
At Case Temperature (T_C) = 25°C				
At Case Temperatures Above 25°C		Derate Linearly at 0.2		W/°C
For Other Conditions		Derate Linearly to 200		°C
* TEMPERATURE RANGE:				°C
Storage and Operating (Junction)		-65 to +200		
* PIN TEMPERATURE:				°C
At distance 1/16 in. (1.58 mm) from seating plane				
for 10 s. max.	235	235	235	

* In accordance with JEDEC registration data format JS-6 RDF-2 (2N3583), JS-6 RDF-1 (2N3584, 2N3585, 2N4240).

2N3583-2N3585, 2N4240

ELECTRICAL CHARACTERISTICS at Case Temperature (T_C) = 25°C Unless Otherwise Specified

ELECTRICAL CHARACTERISTICS AT Case Temperature $T_C = 25^{\circ}\text{C}$ Unless Otherwise Specified																	
CHARACTERISTIC	SYMBOL	TEST CONDITIONS							LIMITS								UNITS
		VOLTAGE V dc				CURRENT mA dc			2N3583		2N3584		2N3585		2N4240		
		V_{CB}	V_{CE}	V_{EB}	V_{BE}	I_C	I_E	I_B	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
Collector-Cutoff Current	I_{CEO}		150					0	—	10	—	5	—	5	—	5	mA
Collector-Cutoff Current	I_{CEX}		225		-1.5				—	1.0	—	—	—	—	—	—	—
			340		-1.5				—	—	—	1.0	—	—	—	—	
			450		-1.5				—	—	—	—	—	1.0	—	2.0	
At $T_C = 150^{\circ}\text{C}$	I_{CEX}		225		-1.5				—	3	—	—	—	—	—	—	
			300		-1.5				—	—	—	3	—	3	—	5.0	
Emitter-Cutoff Current	I_{EBO}			6	-6	0			—	5.0	—	0.5	—	0.5	—	0.5	mA
DC Forward-Current Transfer Ratio	h_{FE}		2			750 ^a			—	—	8	80	8	80	10	100	
			2			1 A ^a			—	—	—	—	—	—	—	—	
			10			100 ^a			40	—	40	—	40	—	40	—	
			10			500 ^a			40	200	—	—	—	—	—	—	
			10			750 ^a			10	—	25	100	25	100	—	—	
Collector-to-Emitter Sustaining Voltage:																	V
With base open	$V_{CEO(sus)}$					200	0	175 ^a	—	—	250 ^a	—	300 ^a	—	300 ^a	—	
With external base-to-emitter resistance ($R_{BE} = 50\Omega$)	I_{CER}		250						—	1.0	—	—	—	—	—	—	mA
			300						—	—	—	—	—	—	—	—	
			400						—	—	—	—	—	—	—	1.0	
Base-to-Emitter Saturation Voltage	$V_{BE(sat)}$					750 ^a	75	—	—	—	—	—	—	—	—	—	1.8 V
						1 A ^a	100	—	—	1.4	—	1.4	—	1.4	—	—	
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$					750 ^a	75	—	—	—	—	—	—	—	—	—	1.0 V
						1 A ^a	125	—	—	5	—	0.75	—	0.75	—	—	
Small-Signal Forward Current Transfer Ratio $f = 5$ MHz	h_{fe}		10			200			3	—	3	—	3	—	3	—	
$f = 1$ kHz			30			100			25	350	—	—	—	—	—	—	
Magnitude of Common-Emitter, Small-Signal, Short-Circuit, Forward Current Transfer Ratio $f = 5$ MHz	$ h_{fe} $		10			200			2	—	2	—	2	—	3	—	
Output Capacitance: $V_{CB} = 10$ V, $f = 1$ MHz	C_{obo}	10					0		—	120	—	120	—	120	—	120	pF
Second-Breakdown Collector Current with base forward-biased** (See Figs 1 & 2)	$I_{S/b}$		100						350	—	350	—	350	—	350	—	mA
Saturated Switching Time ($V_{CC} = 200$ V): Rise Time	t_r	(V_{CC}) 200				1 A 750	100 75	—	—	—	—	3	—	3	—	—	0.5 μ s
Storage Time	t_s	(V_{CC}) 200				1 A 750	100 75	—	—	—	—	4	—	4	—	—	6 μ s
Fall Time	t_f	(V_{CC}) 200				750 1 A	75 100	—	—	—	—	—	—	—	—	3	
Thermal Resistance: Junction-to-Case	$R_{\theta JC}$								—	5	—	5	—	5	—	5	$^{\circ}\text{C/W}$
Junction-to-Ambient	$R_{\theta JA}$								—	70	—	70	—	70	—	70	

*In accordance with JEDEC registration data format JS-6 RDF-2 (2N3583), JS-6 RDF-1 (2N3584, 2N3585, 2N4240)

• CAUTION: The sustaining voltages $V_{CEO(sus)}$ MUST NOT be measured on a curve tracer.

** Specified value of $I_{S/b}$ for given value of V_{CE} as base voltage is increased from zero in a positive direction.

^a Pulsed, pulse duration = 300 μ s; duty factor $\leq 2\%$.

2N3583-2N3585, 2N4240

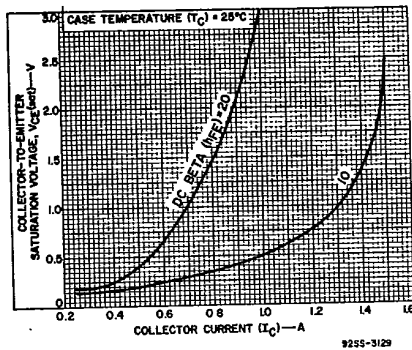


Fig. 3 - Typical collector-to-emitter saturation voltage vs. current for types 2N3584 and 2N3585.

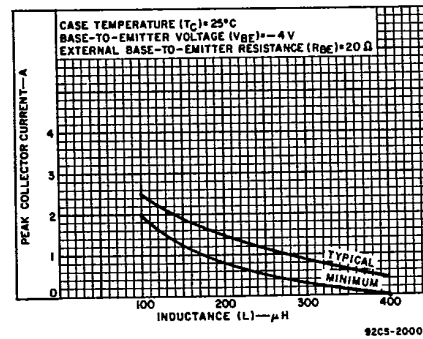


Fig. 4 - Reverse-bias second breakdown characteristics for types 2N3584 and 2N3585.

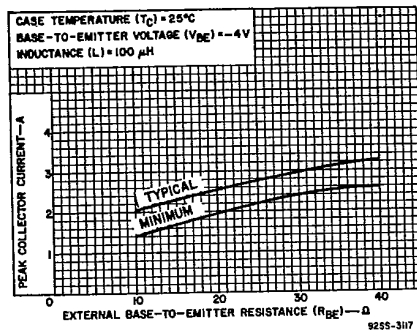


Fig. 5 - Reverse-bias second breakdown characteristics for types 2N3584 and 2N3585.

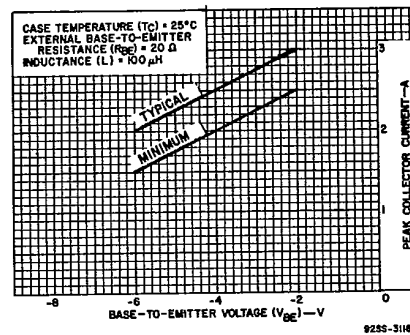


Fig. 6 - Reverse-bias second breakdown characteristics for types 2N3584 and 2N3585.

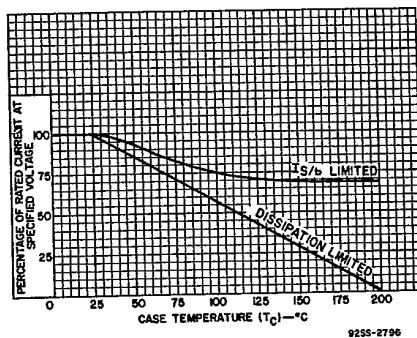


Fig. 7 - Dissipation derating curves for all types.

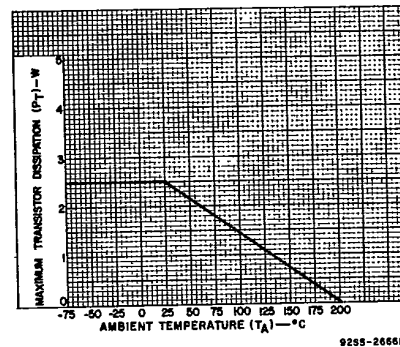


Fig. 8 - Dissipation derating curve for types 2N3583, 2N3584, 2N3585, and 2N4240.

High-Voltage Power Transistors

2N3583-2N3585, 2N4240

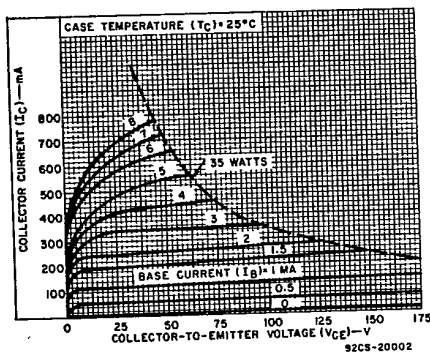


Fig. 9 - Typical output characteristics for type 2N3583.

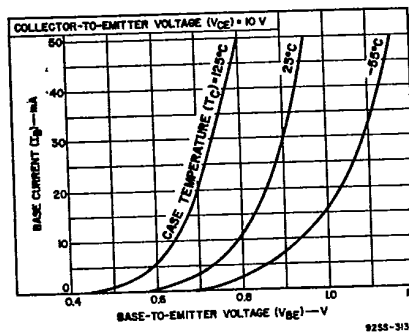


Fig. 10 - Typical input characteristics for all types.

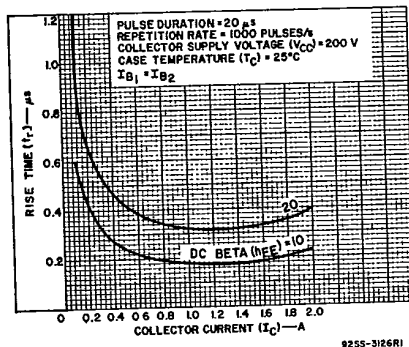


Fig. 11 - Typical rise time vs. collector current for types 2N3584 and 2N3585.

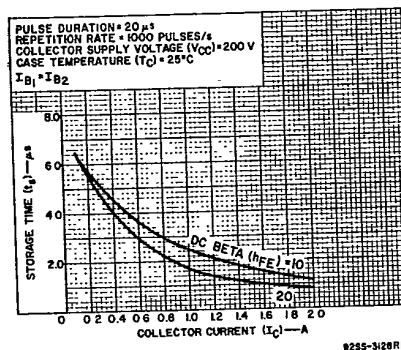


Fig. 12 - Typical storage time vs. collector current for types 2N3584 and 2N3585.

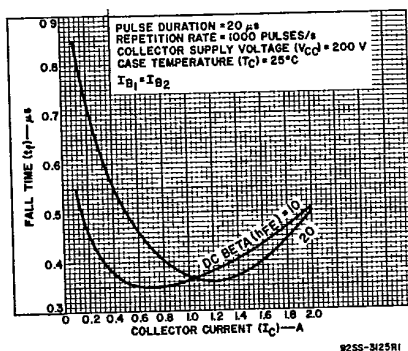


Fig. 13 - Typical fall time vs. collector current for types 2N3584 and 2N3585.

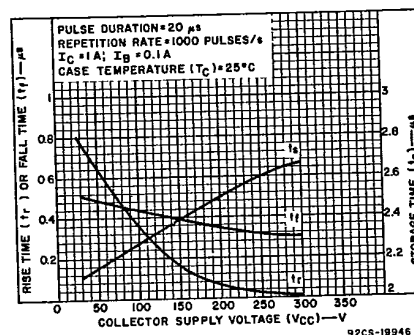


Fig. 14 - Typical rise time, fall time, and storage time vs. collector supply voltage for types 2N3584 and 2N3585.

COLLECTOR-TO-EMITTER VOLTAGE (V_{CE}) = 10 V

DC FORWARD-CURRENT TRANSFER RATIO (h_{FE})

125°C

CASE TEMPERATURE (T_C) = 25°C

-55°C

COLLECTOR CURRENT (I_C) — mA

9255-3150

Fig. 16 - Typical dc beta vs. collector current for types 2N3584 and 2N3585.

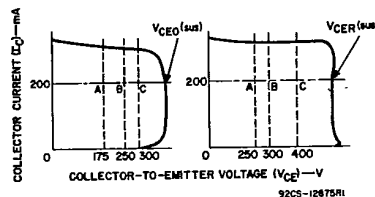


Fig. 18 - Oscilloscope display for measurement of sustaining voltages.

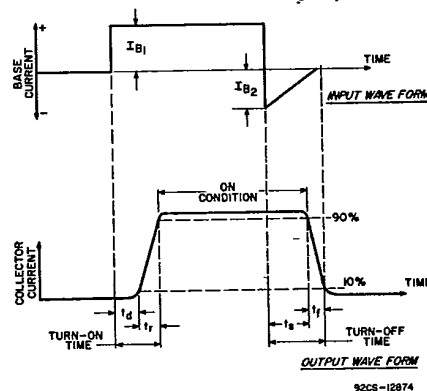


Fig. 20 - Phase relationship between input and output currents, showing reference points for specification of switching times.