High-Voltage, High-Power Silicon N-P-N Power Transistor

For Switching and Linear Applications in Military, Industrial and Commercial Equipment

RCA411

Features:

- **Maximum safe-area-of-operation curves**
- **Low saturation voltage: $V_{CE}^{(sat)}$ = 0.8V max**
- **High voltage rating: $V_{CEO}^{(sus)}$ = 300V**
- **High dissipation rating: P_T = 125W**
- **Steel Hermetic TO-3 Package**

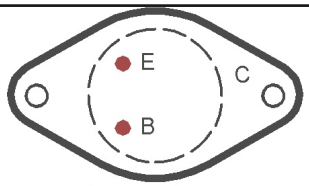
Applications:

- **Inverter**
- **Deflection Circuits**
- **Switching Regulators**
- **High-Voltage Bridge Amplifiers**
- **Ignition circuits**

The RCA411 is an epitaxial silicon n-p-n power transistor utilizing a multiple-emitter-site structure. This device employs the popular TO-3 package.

Featuring high-breakdown voltage ratings and low saturation voltage values, the RCA411 is especially suitable for use in inverters, deflection circuits, switching regulators, high voltage bridge amplifiers, ignition circuits and other high-voltage switching applications.

Terminal Designations



bottom view

JEDEC TO-3

MAXIMUM RATINGS, *Absolute-Maximum Values:*

V_{CBO}	300	V
$V_{CEO}^{(sus)}$	300	V
V_{EBO}	5	V
I_C	7	A
I_{CM}	10	A
I_B	2	A
P_T **$T_C \leq 25°C$**, V_{CE} up to 75V	125	W
P_T **$T_C > 25°C$**, V_{CE} above 75V	see Fig. 1	W/°C
T_{stg} T_J	-65 to +200	°C
T_L At distance ≥ 1/32 in. (0.8mm) from seating plane for 10s max.	230	°C

Source: RCA SSD-220C (1981)

Electrical Characteristics, *at Case Temperature (T_C) = 25°C*
Unless Otherwise Specified

Characteristic	Symbol	Test Conditions					Limits			Units
		DC Collector Voltage (V)	DC Emitter or Base Voltage (V)		DC Current (A)					
		V_{CE}	V_{EB}	V_{BE}	I_C	I_B	Min.	Typ.	Max.	
Collector Cutoff Current with base open	I_{CEO}	300					-	-	0.25	mA
with base-emitter junction reverse biased	I_{CEV}	300		1.5			-	-	0.25	
with base-emitter junction reverse biased & T_C 125°C	I_{CEV}	300		-1.5			-	-	0.5	
Emitter Cutoff Current	I_{EBO}		5				-	-	5.0	mA
DC Forward Current Transfer Ratio	h_{FE}	5			1.0[a]		30	-	90	
		5			2.5[a]		10	-	-	
Collector to Emitter Sustaining Voltage with base open	$V_{CEO}^{(sus)}$[b]				0.1		300[b]	-	-	V
Base to Emitter Saturation Voltage	$V_{BE}^{(sat)}$				1.0[a]	0.1	-	0.9	1.5	V
Collector to Emitter Saturation Voltage	$V_{CE}^{(sat)}$				1.0[a]	0.1	-	0.2	0.8	V
Second Breakdown Collector Current (With base forward biased) Pulse duration (non-repetitive) 1s	$I_{S/b}$[c]	150					0.3	-	-	A
Gain Bandwidth Product	f_T	10			0.2		-	2.5	-	MHz
Switching Time Rise	f_r				1.0	0.1 (I_{B1}) / -0.5 (I_{B2})	-	0.35	-	µs
Storage	f_s				1.0	0.1 (I_{B1}) / -0.5 (I_{B2})	-	1.4	-	
Fall	f_f				1.0	0.1 (I_{B1}) / -0.5 (I_{B2})	-	0.15	-	
Thermal Resistance (Junction to Case)	$R_{\theta JC}$	10			5		-	-	1.4	°C/W

a Pulsed: pulse duration ≤ 350µs, duty factor = 2%
b CAUTION: The sustaining voltage $V_{CEO}^{(sus)}$ *MUST NOT* be measured on a curve tracer
c $I_{S/b}$ is defined as the current at which second breakdown occurs at a specified collector voltage with the emitter-base junction forward-biased for transistor operation in the active region

Source: RCA SSD-220C (1981)

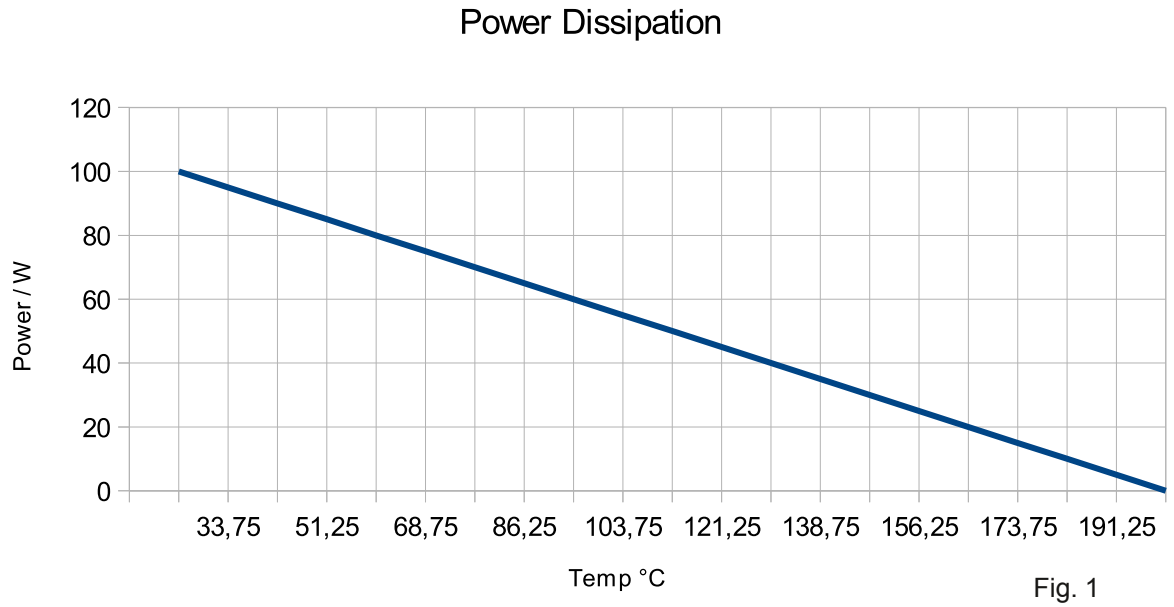


Fig. 1

I_C	- continous collector current
I_{CM}	- peak collector current
I_{CER}	- collector-cutoff current with specified resistance between base and emitter
I_{CEX}	- collector-cutoff current with specified circuit between base and emitter
I_B	- continous base current
I_{EBO}	- emitter-cutoff current, collector open
$I_{S/b}$	- forward-bias, second break-down collector current
V_{CBO}	- collector-to-base voltage, emitter open
V_{CEO}	- collector-to-emitter voltage, base open
$V_{CEO}^{(sus)}$	- collector-to-emitter sustaining voltage, base open
$V_{CER}^{(sus)}$	- collector-to-emitter sustaining voltage with specified resistance between base and emitter
V_{EBO}	- emitter-to-base voltage, collector open
V_{BE}	- base-to-emitter voltage
V_{CE}^{sat}	- collector-to-emitter saturation voltage
C_{OB}	- common-base output capacitance
C_{OBO}	- open circuit common-base output capacitance
fT	- gain-bandwidth product (unity-gain frequency for devices in which gain roll-off has a -1 slope)
h_{FE}	- dc forward-current transfer ratio
$\|h_{fe}\|$	- magnitude of common-emitter, small-signal, short-circuit, forward-current transfer ratio
R_{BE}	- external base-to-emitter resistance
$R_{\theta JC}$	- thermal resistance, junction-to-case
P_T	- transistor dissipation at specified temperature
t_f	- fall time
t_r	- rise time
t_s	- storage time
T_C	- case temperature
T_{stg}	- storage temperature
T_J	- operating (junction) temperature
T_L	- lead temperature during soldering
θ	- conduction angle