

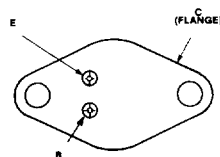
25-A SwitchMax Power Transistors

N-P-N Types for Power Supplies and Other High Voltage Switching Applications

Features:

- High-temperature parameters guaranteed
- Fast switching speed
- Low $V_{CE(sat)}$

TERMINAL DESIGNATIONS



92CS-275-6

JEDEC TO-204AA

The 2N6686 and 2N6687 and 2N6688* SwitchMax 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-current, high-speed transistors are 100% 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 guaranteed at 125°C as well as

at 25°C, to provide information necessary for worst-case design.

The 2N6686, 2N6687 and 2N6688 transistors are supplied in steel JEDEC TO-204AA hermetic packages.

*Formerly RCA Dev. Type Nos. TA9119A, TA9119B, TA9119C, respectively.

MAXIMUM RATINGS, Absolute-Maximum Values:

	2N6686	2N6687	2N6688	
* V_{CEV}				
$V_{BE} = -1.5 V$	260	280	300	V
* V_{CEX} (Clamped)				
$V_{BE} = -1.5 V$	210	230	250	V
* V_{CEO}	160	180	200	V
* V_{EBO}		8		V
* $I_C(sat)$	25	25	20	A
* I_C	25	25	20	A
* I_{CM}		50		A
* I_B		8		A
* P_T				
T_C up to 25°C		200		W
T_C above 25°C, derate linearly		1.14		W/°C
* T_{stg}, T_J		-65 to 200		°C
* T_L				
At distance $\geq 1/16$ in. (1.58 mm) from seating plane for 10 s max.		235		°C

* In accordance with JEDEC registration data (2N6686, 2N6687, 2N6688 only).

2N6686, 2N6687, 2N6688

ELECTRICAL CHARACTERISTICS $T_C = 25^\circ C$

CHARACTERISTIC	TEST CONDITIONS				LIMITS						UNITS
	VOLTAGE V dc		CURRENT A dc		2N6686		2N6687		2N6688		
	V _{CE}	V _{BE}	I _C	I _B	Min.	Max.	Min.	Max.	Min.	Max.	
I _{CEV}	260	-1.5	—	—	—	50	—	—	—	—	μA
	280	-1.5	—	—	—	—	—	50	—	—	
	300	-1.5	—	—	—	—	—	—	—	50	
I _{EBO}	—	-8	0	—	—	100	—	100	—	100	
V _{CEO(SUS)} ^b	—	—	0.2 ^a	0	160	—	180	—	200	—	V
h _{FE}	2	—	1 ^a	—	30	—	30	—	25	—	—
	2	—	10 ^a	—	25	100	25	100	20	80	
	2	—	20 ^a	—	—	—	—	—	15	—	
	2	—	25 ^a	—	15	—	15	—	—	—	
V _{BE(sat)}	—	—	20 ^a	2	—	—	—	—	—	1.8	V
	—	—	25 ^a	2.5	—	1.8	—	1.8	—	—	
V _{CE(sat)}	—	—	20 ^a	2	—	—	—	—	—	1.5	V
	—	—	25 ^a	2.5	—	1.5	—	1.5	—	—	
V _{CEX} ^b (Clamped E _{S,b}) L = 25 μH, R _{BB} = 10 Ω	—	-4	25	3	210	—	230	—	250	—	
I _{S,b} 2N6686, 2N6687, 2N6688	18	—	11.1	—	1	—	1	—	1	—	s
h _{ie} f = 5 MHz	10	—	1	—	4	20	4	20	4	20	—
f _T	10	—	1	—	20	100	20	100	20	100	MHz
C _{obo} f = 0.1 MHz	10 ^c	—	—	—	300	650	300	650	300	650	pF
t _d ^d	—	-4	20	2	—	—	—	—	—	0.1	μs
	—	-4	25	2.5	—	0.1	—	0.1	—	—	
t _r ^d	—	-4	20	2	—	—	—	—	—	0.60	μs
	—	-4	25	2.5	—	0.60	—	0.60	—	—	
t _s ^d	—	-4	20	2 ^e	—	—	—	—	—	1.50	μs
	—	-4	25	2.5 ^e	—	1.50	—	1.50	—	—	
t _f ^d	—	-4	20	2 ^e	—	—	—	—	—	0.25	μs
	—	-4	25	2.5 ^e	—	0.25	—	0.25	—	—	
t _c V _{CC} = 80 V, L = 25 μH, R _c ≤ 4 Ω, Collector clamped to V _{CEX}	—	-4	20	3 ^e	—	—	—	—	—	0.5	μs
	—	-4	25	3 ^e	—	0.5	—	0.5	—	—	

2
POWER TRANSISTORS

2N6686, 2N6687, 2N6688

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

CHARACTERISTIC	TEST CONDITIONS				LIMITS						UNITS
	VOLTAGE V dc		CURRENT A dc		2N6686		2N6687		2N6688		
	V_{CE}	V_{BE}	I_C	I_B	Min.	Max.	Min.	Max.	Min.	Max.	
I_{CEV}	260	-1.5	—	—	—	0.5	—	—	—	—	mA
	280	-1.5	—	—	—	—	—	0.5	—	—	
	300	-1.5	—	—	—	—	—	—	—	0.5	
$V_{CE(sat)}$	—	—	20 ^a	2	—	—	—	—	—	1.5	V
	—	—	25 ^a	2.5	—	1.5	—	1.5	—	—	
t_d^d	—	-4	20	2	—	—	—	—	—	0.8	μs
	—	-4	25	2.5	—	0.8	—	0.8	—	—	
t_s^d	—	-4	20	2	—	—	—	—	—	2.5	
	—	-4	25	2.5 ^e	—	2.5	—	2.5	—	—	
t_r^d	—	-4	20	2	—	—	—	—	—	0.8	
	—	-4	25	2.5 ^e	—	0.8	—	0.8	—	—	
t_c $V_{CC} = 80\text{ V}$, $L = 25\ \mu\text{H}$, $R_C \leq 4\ \Omega$, Collector Clamped to V_{CEX}	—	-4	20	3 ^e	—	—	—	—	—	0.8	
	—	-4	25	3 ^e	—	0.8	—	0.8	—	—	
$R\theta_{JC}$ 2N6686, 2N6687, 2N6688	10	—	5	—	—	0.875	—	0.875	—	0.875	$^\circ\text{C/W}$

* In accordance with JEDEC registration data.

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

^b CAUTION: The sustaining voltage $V_{CEO(sus)}$ and V_{CEX} MUST NOT be measured on a curve tracer.

^c V_{CB} value.

^d $V_{CC} = 80\text{ V}$, $t_p = 20\ \mu\text{s}$.

^e $I_{B1} = -I_{B2}$.

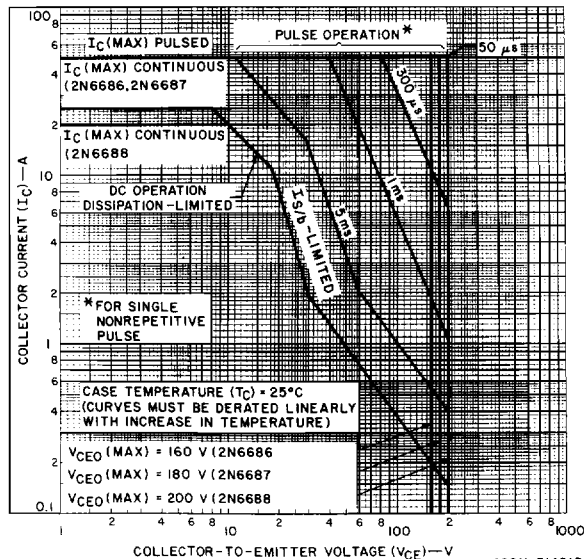


Fig. 1 - Maximum operation areas of all types. ($T_C = 25^\circ$).

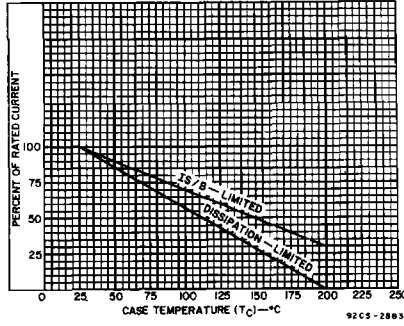


Fig. 2 - Dissipation and I_{Sb} derating curves for 2N6686 and 2N6687 and 2N6688.

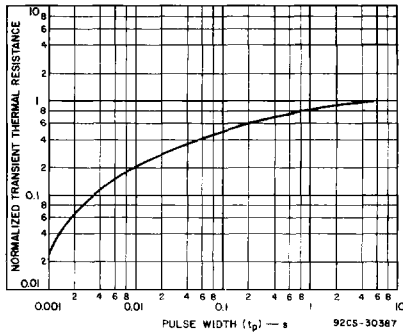


Fig. 3 - Typical thermal-response characteristic for all types.

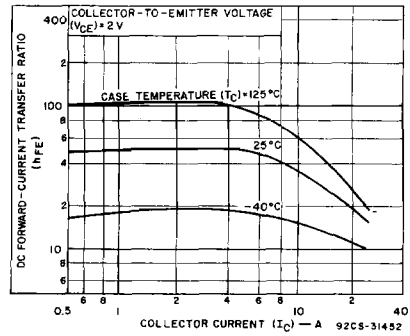


Fig. 4 - Typical dc beta characteristics for all types.

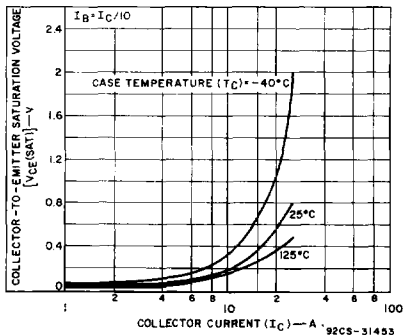


Fig. 5 - Typical collector-to-emitter saturation voltage characteristics for all types.

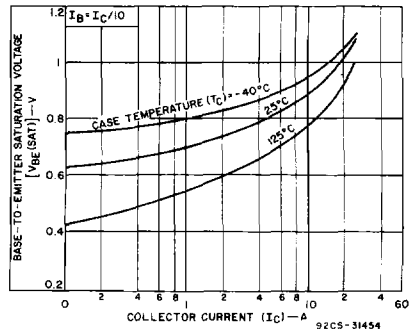


Fig. 6 - Typical base-to-emitter saturation voltage characteristics for all types.

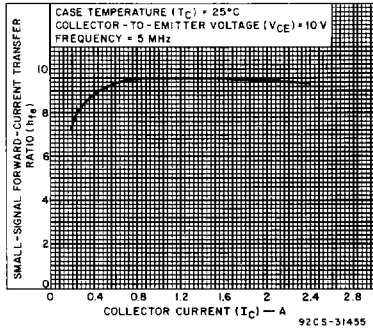


Fig. 7 - Typical small-signal forward current transfer ratio characteristic for all types (f = 5MHz).

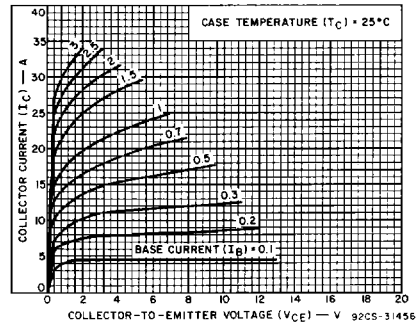


Fig. 8 - Typical output characteristics for all types.

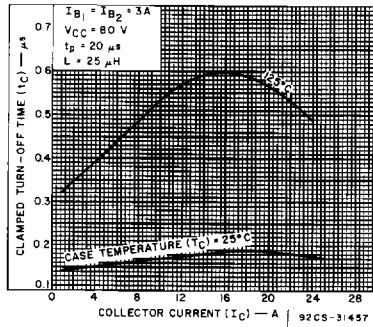


Fig. 9 - Typical clamped turn-off time characteristics for all types.

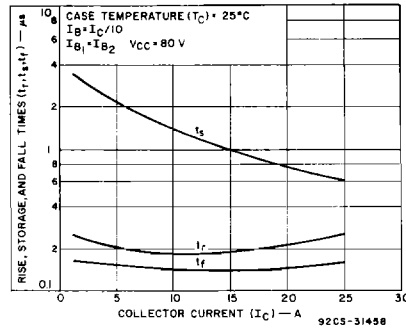


Fig. 10 - Typical saturated-switching-time characteristics as a function of collector current for all types.

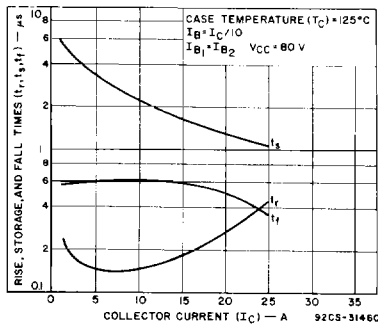


Fig. 11 - Typical saturated-switching-time characteristics at T_C = 125°C as a function of collector current for all types.

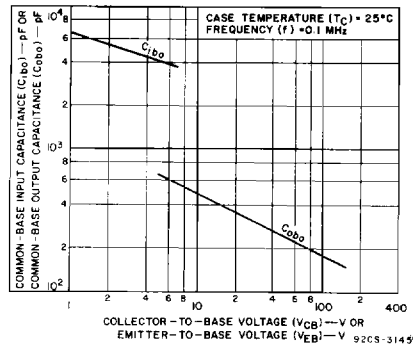


Fig. 12 - Typical common-base input (C_{ibo}) or output (C_{obo}) capacitance characteristics for all types.

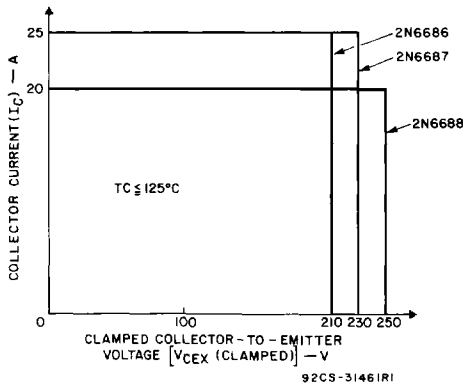


Fig. 13 - Maximum operating conditions for switching between saturation and cutoff for all types.

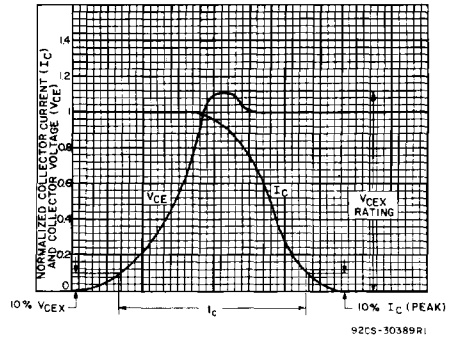


Fig. 14 - Oscilloscope display for normalized measurement of clamped inductive switching time (t_c).