

# 1-A *SwitchMax* VERSAWATT Transistors

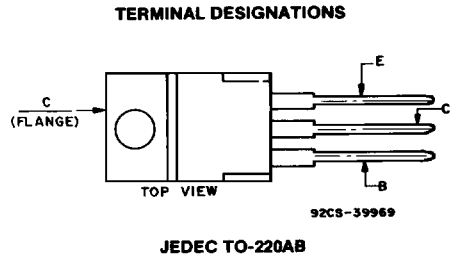
High-Voltage N-P-N Types for Off-Line Power Supplies and Other High-Voltage Switching Applications

**Features:**

- High-temperature parameters guaranteed
- Fast switching speed
- High voltage ratings:  
 $V_{CEX} = 350\text{ V to }450\text{ V}$
- Low  $V_{CE(sat)}$  at  $I_C = 1\text{ A}$
- VERSAWATT package

**Applications:**

- Off-line power supplies
- High-voltage inverters
- Switching regulators



The 2N6771, 2N6772, and 2N6773\* 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 and are also well suited for use in a wide range of inverter or converter circuits, and pulse-width-modulated regulators. These high-voltage, high-speed transistors are 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 to provide information necessary for worst-case design.

The 2N6771, 2N6772, and 2N6773 series transistors are supplied in the JEDEC TO-220AB VERSAWATT plastic packages.

\*Formerly RCA8863A, RCA8863B, and RCA8863C, respectively.

**2**  
POWER TRANSISTORS

**MAXIMUM RATINGS, Absolute-Maximum Values:**

	2N6771	2N6772	2N6773	
* $V_{CEV}$ $V_{BE} = -1.5\text{ V}$ .....	450	550	650	V
* $V_{CEX}$ (Clamped) $V_{BE} = -1.5\text{ V}$ .....	350	400	450	V
* $V_{CEO}$ .....	300	350	400	V
* $V_{EBO}$ .....		8		V
* $I_C$ (sat) .....		1		A
* $I_C$ .....		1		A
* $I_{CM}$ .....		2		A
* $I_B$ .....		0.6		A
* $P_T$ $T_C$ up to 25°C .....		40		W
$T_C$ above 25°C, derate linearly .....		0.32		W/°C
* $T_{stg}$ , $T_J$ .....		-65 to 150		°C
* $T_L$ At distance $\geq 1/8$ in. (3.17 mm) from seating plane for 10 s max. ....		235		°C

\*In accordance with JEDEC registration data.

# 2N6771, 2N6772, 2N6773

## ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	TEST CONDITIONS				LIMITS						UNITS
	VOLTAGE		CURRENT		2N6771		2N6772		2N6773		
	V dc	A dc	Ic	Ib	Min.	Max.	Min.	Max.	Min.	Max.	

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

ICEV	450	-1.5			—	0.1	—	—	—	—	mA
	550	-1.5			—	—	—	0.1	—	—	
	650	-1.5			—	—	—	—	—	0.1	
IEBO		-8	0		—	2	—	2	—	2	
VCEO(sus) <sup>b</sup>			0.2 <sup>a</sup>	0	300	—	350	—	400	—	V
VCE(sat)			1 <sup>a</sup>	0.2	—	1.0	—	1.0	—	1.0	
VBE(sat)			1 <sup>a</sup>	0.2	—	1.2	—	1.2	—	1.2	
hFE	3		0.3 <sup>a</sup>		20	100	20	100	20	100	
	3		1 <sup>a</sup>		10	50	10	50	10	50	
VCEX <sup>b</sup> (Clamped ES/b) L=450 $\mu\text{H}$ , R <sub>BB</sub> =50 $\Omega$		-5	1	0.1 <sup>e</sup>	350	—	400	—	450	—	V
IS/b	100		0.4		0.5	—	0.5	—	0.5	—	s
h <sub>fe</sub>   f=1 MHz	10		0.2		10	50	10	50	10	50	
f <sub>T</sub>	10		0.2		10	50	10	50	10	50	MHz
C <sub>obo</sub> f=0.1 MHz	10 <sup>c</sup>				20	60	20	60	20	60	pF
t <sub>d</sub> <sup>d</sup>			1	0.2	—	0.05	—	0.05	—	0.05	$\mu\text{s}$
t <sub>r</sub> <sup>d</sup>			1	0.2	—	0.4	—	0.4	—	0.4	
t <sub>s</sub> <sup>d</sup>			1	0.2 <sup>e</sup>	—	2.5	—	2.5	—	2.5	
t <sub>f</sub> <sup>d</sup>			1	0.2 <sup>e</sup>	—	0.6	—	0.6	—	0.6	
t <sub>c</sub> V <sub>CC</sub> =200 V, L=450 $\mu\text{H}$ , R <sub>C</sub> =200 $\Omega$ Collector clamped to V <sub>CEX</sub>			1	0.2 <sup>e</sup>	—	0.6	—	0.6	—	0.6	

$T_C=125^\circ\text{C}$

ICEV	450	-1.5			—	1	—	—	—	—	mA
	550	-1.5			—	—	—	1	—	—	
	650	-1.5			—	—	—	—	—	1	
VCE(sat)			1 <sup>a</sup>	0.2	—	2	—	2	—	2	V
t <sub>r</sub> <sup>d</sup>			1	0.2	—	0.8	—	0.8	—	0.8	$\mu\text{s}$
t <sub>s</sub> <sup>d</sup>			1	0.2 <sup>e</sup>	—	4.5	—	4.5	—	4.5	
t <sub>f</sub> <sup>d</sup>			1	0.2 <sup>e</sup>	—	1.5	—	1.5	—	1.5	
t <sub>c</sub> V <sub>CC</sub> =200 V, L=450 $\mu\text{H}$ , R <sub>C</sub> =200 $\Omega$ Collector clamped to V <sub>CEX</sub>			1	0.2 <sup>e</sup>	—	1.5	—	1.5	—	1.5	
R <sub>θJC</sub>	20		1		—	3.12	—	3.12	—	3.12	
R <sub>θJA</sub>					—	70	—	70	—	70	$^\circ\text{C/W}$

<sup>a</sup>In accordance with JEDEC registration data.

<sup>b</sup>Pulsed: pulse duration = 300  $\mu\text{s}$ , duty factor  $\leq 2\%$ .

<sup>c</sup>CAUTION: The sustaining voltage V<sub>CEO</sub>(sus)

and V<sub>CEX</sub> MUST NOT be measured on a curve tracer.

<sup>d</sup>V<sub>CB</sub> value.

<sup>e</sup>I<sub>B1</sub> = -I<sub>B2</sub>.

<sup>f</sup>V<sub>CC</sub> = 200 V, t<sub>p</sub> = 20  $\mu\text{s}$ .

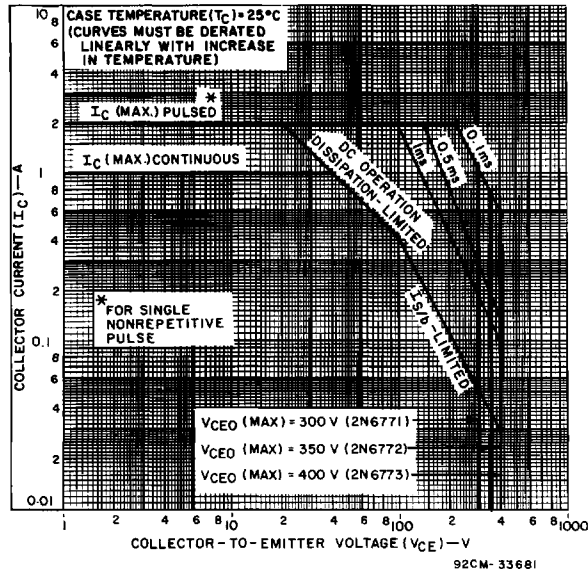


Fig. 1 — Maximum operating areas for all types.

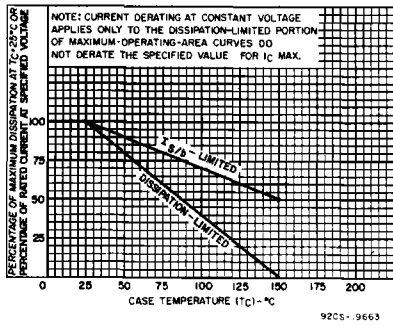


Fig. 2 — Derating curve for all types.

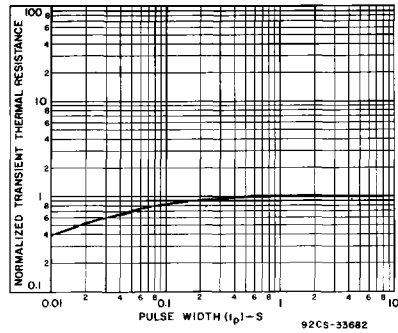


Fig. 3 — Typical thermal-response characteristics for all types.

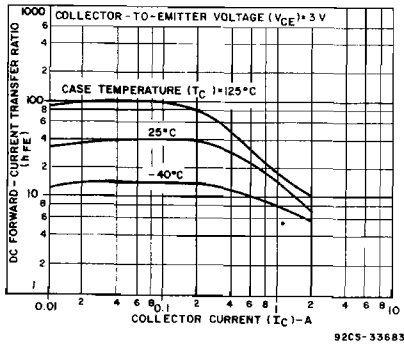


Fig. 4 — Typical dc beta characteristics for all types.

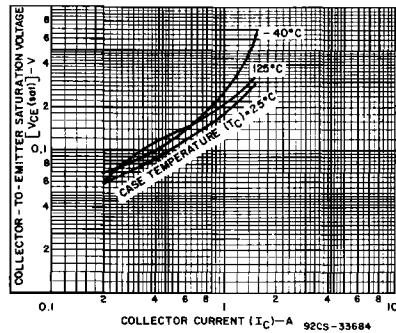


Fig. 5 — Typical collector-to-emitter saturation voltage as a function of collector current for all types.

# 2N6771, 2N6772, 2N6773

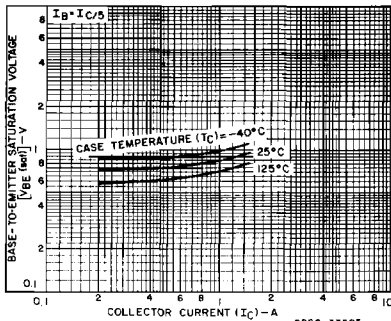


Fig. 6 — Typical base-to-emitter saturation voltage as a function of collector current for all types.

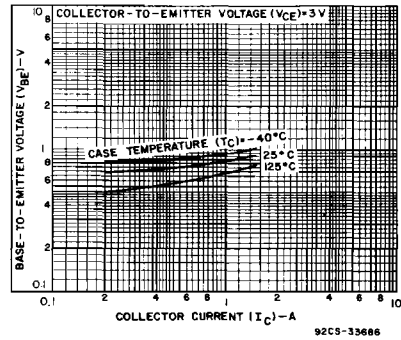


Fig. 7 — Typical base-to-emitter voltage as a function of collector current for all types.

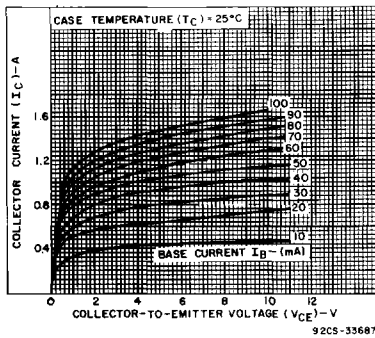


Fig. 8 — Typical output characteristics for all types.

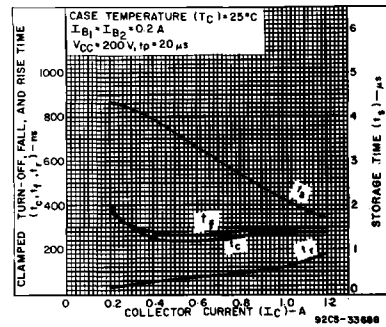


Fig. 9 — Typical saturated-switching-time characteristics for all types.

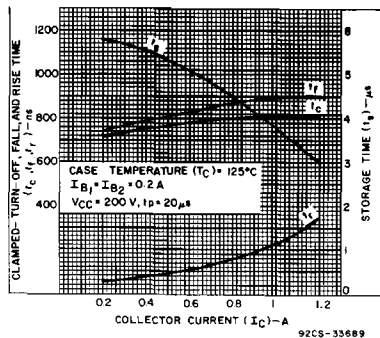


Fig. 10 — Typical saturated-switching-time characteristics as a function of collector current for all types.

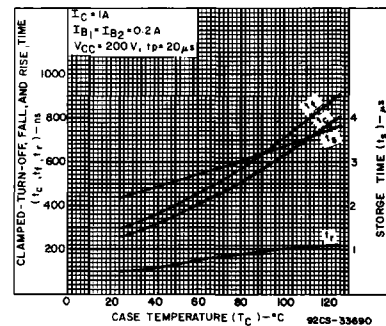


Fig. 11 — Typical saturated-switching-time characteristics as a function of case temperature for all types.

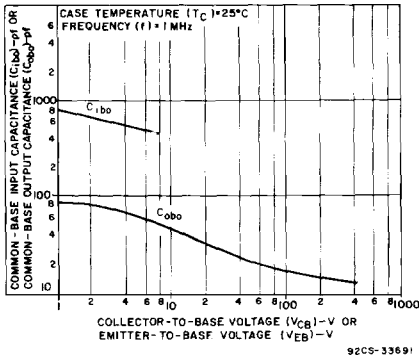


Fig. 12 — Typical common-base input or output capacitance characteristics as a function of collector-to-base voltage or emitter-to-base voltage for all types.

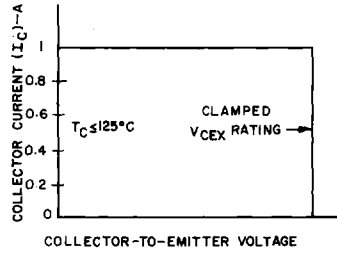


Fig. 13 — Maximum operating conditions for switching between saturation and cutoff.

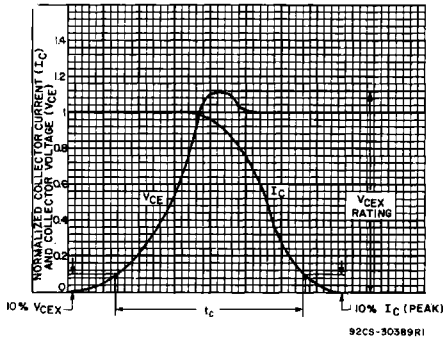


Fig. 14 — Oscilloscope display for measurement of clamped induction switching time ( $t_c$ ).

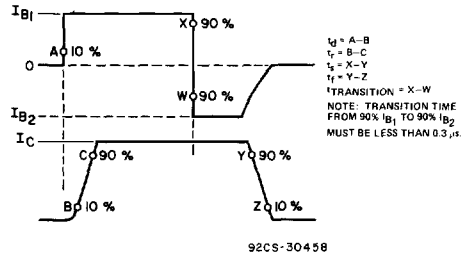


Fig. 15 — Phase relationship between input and output currents showing reference points for specification of switching times.

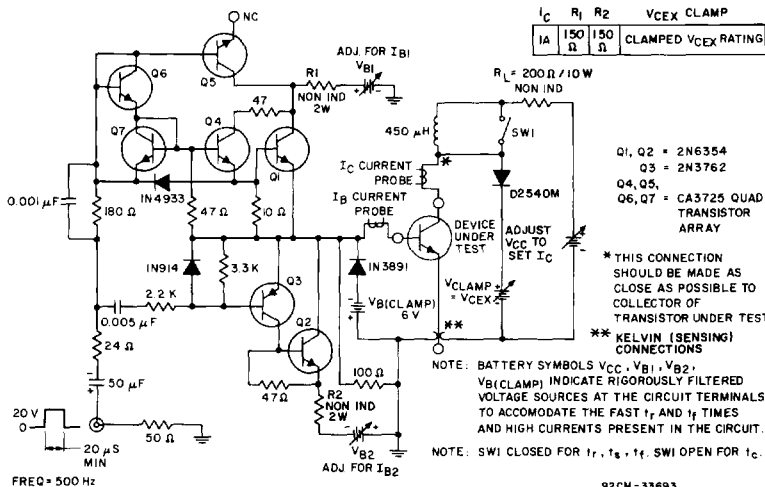


Fig. 16 — Circuit for measuring switching times.